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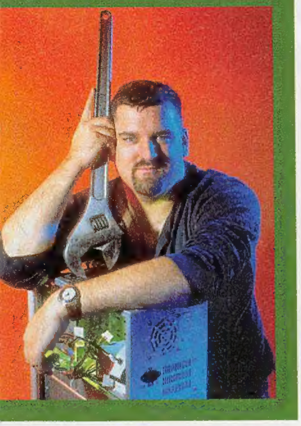


Skidmarking your PC

Everyone brags about benchmarks, but nobody does anything about them. Well, all that's about to end.

The *boot* editors have started the latest craze in personal computing: racing for pink slips. You think your system's tough? Put up or shut up! That's right, we've been going to local computer swap meets and bringing our homemade muscle with us on a dolly. We roll up alongside some greaser flexing his MHz for the ladies, and just one look makes it clear: We mean business.

Both parties hand their pink slip, to the fox in the capri pants (actually it's usually just pink post-it notes that say, "IOU my PC"), she takes the scarf from around her neck (also a requirement), raises it high above her head, and both parties load the bootMarks.

The scarf drops and it's time to rev on the redline.

Beads of sweat trickle down the forehead of our victim as we both run Norton's bootMark. Their knuckles go white as we blaze through the *Quake* demo. An uncontrollable twitch begins as *Visual C++* compiles.

Then comes SYSmark. This burly test of a system's studliness runs the actual kernel of a slew of real-world apps—such as *PageMaker*, *Word*, *Excel*, *CorelDraw*, and *Powerpoint*—and can bring the most capable machine to its virtual knees.

This takes a couple of hours, so at this point we like to go to lunch with our nemesis. Usually grilled cheese sandwiches.

> We **roll up** alongside some greaser flexing his **MHz** for the ladies, and just one look makes it clear: **We mean business.**

But when we get back, it's *all* business. Scores are tallied, people from our art department whip up charts in *QuarkXpress* (running on Kick-Ass notebook PCs), and dye-sub color prints are generated.

Everyone then gathers around and studies the numbers. There's some debate... "Sure his VidTach may beat mine, but I have video IN and OUT!" And, "Screw visual quality, my D3D score is higher and the bottom-line number is all that counts!" But after all is said and run, one of us stands victorious.

And one of us doesn't have a PC anymore.

Sure this is tough. Sure it's cruel. But you've gotta be cruel to be kind in this two-PCs-enter-one-PC-leaves world. And *boot*'s gonna be the last man standing.

Brad Dosland
Editor in Chief

Sony 500PS, *page 79*

NEWS

14 bootWire **News** that **matters.**
Back when boot *was just a lil' grommet, a small company called* ***Nimantics*** *was beating all the big companies to the punch with notebooks running ahead of the pack ... by packing desktop CPUs instead of mobile versions. Now the revolutionary company has* ***disappeared into the night****, and its customers, along with the local and federal authorities, are searching for its owners. ALSO:* ***Bonded modems*** *deliver the speed that esoteric technologies promise.*

VOICES

21 The Saint ***Alex St. John*** *cooks up some* ***mischief*** *from the pages of the Microsoft* ***Anarchists'*** *Cookbook.*

23 Game Theory ***T. Liam McDonald*** *has a lucid vision that the laws of* ***evolution*** *are finally catching up with the* ***inbred*** *PC game industry.*

25 On the Line ***Shel Kimen*** *is the voice from deep left field that is* ***crying out*** *in defense of* ***Java****.*

27 Fast Forward ***Tom Halfhill****'s surprised at how little* ***hype*** *Intel's 64-bit CISC/RISC processor is getting.* ***Merced*** *cometh!*

96 Glitch ***Jon Phillips*** *is in the field this month, reporting on the* ***bloody*** *standoff going down in the hills of* ***Redmond****, WA.*

DEPARTMENTS

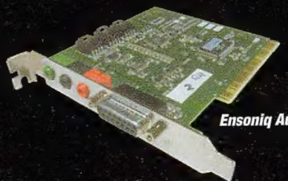
5 Comm Port *Readers* ***buzz*** *via e-mail, fax, and post-partum syndrome.*

12 bootDisc *Your guide to the* ***joys*** *of our shiny silver platter. A sampling of this month's treasures includes:* ***100MB of PDA software!*** *PLUS QuarkXpress 4.0, Bryce 3D, CorelDraw 8, MediaStudio Pro 5.0, Ultim@te Race Pro, Agile HTML Editor, and much, much more.*

18 Pure Lust ***Tech*** *toys for digital girls and boys.*

52 White Paper/12-Step Clinic *This month, the mysteries of* ***core-logic chipsets*** *are delved. This little-known component is to the PC what the* ***immortal soul*** *is to humans. ALSO a slew of tips and techniques to soothe your burning sensations in this month's All-Andrew episode of Clinic.*

56 bootWorthy *No man is an island and no PC should be without a powerboat of a modem to get around in. If you're not surfing at 56K, you're sinking in the mire. Check out this month's roundup of the best* ***modems*** *in the wet wired world.*



Ensoniq AudioPCI S5016, *page 68*

CONTENT

P/REVIEWS

60 Previews *We've got two, count 'em, two hands-on exclusives this month. First, check out our test drive of* ***DirectX 6****, straight from Microsoft's developer Meltdown in Redmond. Then gorge yourself on the first* ***BX-endowed*** *motherboard running at a bus speed of 100MHz and delivering some 400MHz P-II lovin'. We've got the pix and numbers!*

64 Reviews *You wanted the truth about* ***PCI-based soundcards*** *and boot delivers. We ran a quartet of the latest in sound technology through the gauntlet and warn you: Don't abandon the ISA bus till you read this!*

ALSO:

- ***Intel's i740*** *powers Real3D's StarFighter accelerator to new heights of visual quality.*
- *Deep in the heart of Polywell's latest beats an* ***AMD K6*** *266MHz.*
- *Get creative with reviews of* ***Bryce 3D, QuarkXpress 4.0, Corel Draw 8****, and a pair of editors to create killer online content.*

FEATURES

42 Notebook Autopsy

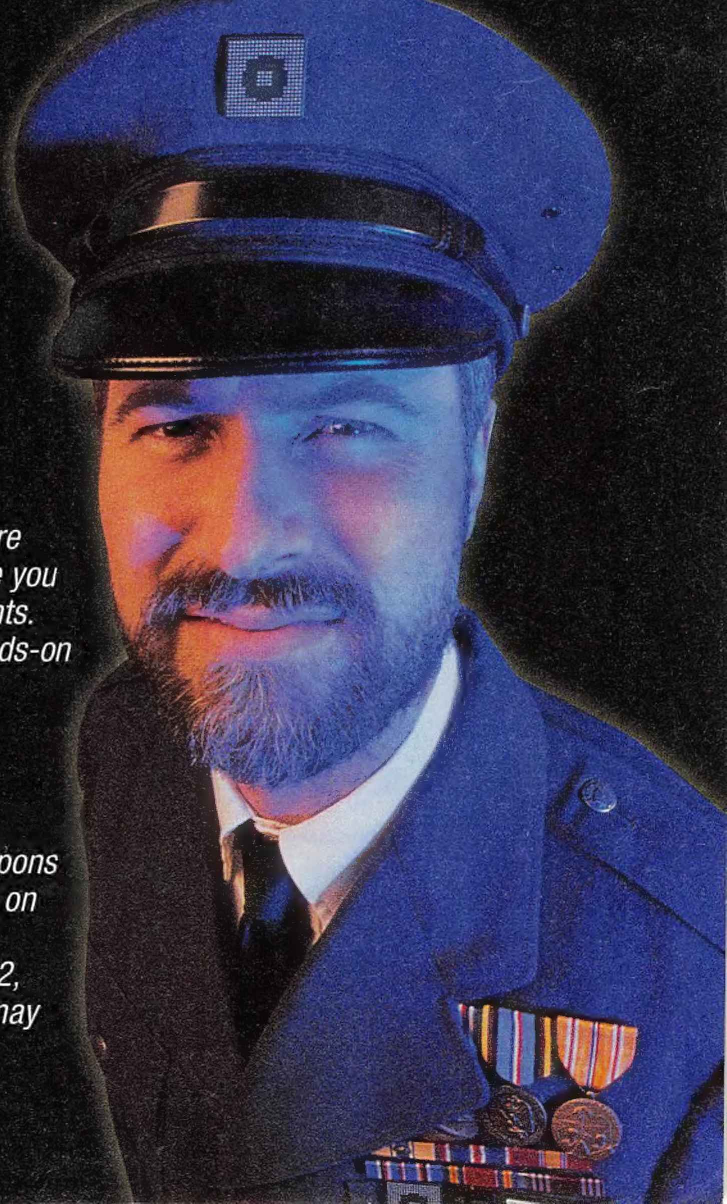
Notebook PCs show no signs of aggressive behavior—yet. So before these ***intelligent alien life forms*** *crash down on your Roswellian landing pad and get the better of you, read our* ***startling autopsy*** *results to see what makes them tick. Don't make your next notebook purchase until you do.*

48 PDAs (Public Displays of Affection)

If you simply must fondle your ***PDA*** *in public, make sure you're playing with this year's* ***hottest model****. We give you the gift of love: 1998's sexiest Personal Digital Assistants. We've got the first Windows CE 2.0 palmtop and a hands-on world exclusive preview of the* ***Palm III****.*

30 Lip: nVidia's David Kirk

His business card says he's the ***Minister of Armaments****, and he has one of the deadliest 3D weapons around: the* ***Riva 128****. But is it strong enough to take on the Intel i740 stormtroopers? Kirk says it is, and he's more than ready to kick the crap out of i740, Voodoo 2, PowerVR, and anything else that his 3D competitors may have brewing in their* ***war rooms****.*



Cover Photograph by Mark Madeo

Microsoft

"This is the kind of game that can wreck a marriage.... Best Overall Game of 1997." —Gamezilla 1.3.98

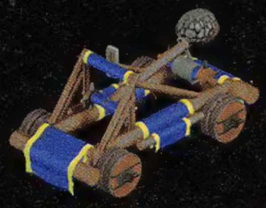
"If you love the smell of burning arrows in the morning... Age of Empires is just what the general ordered." —Newsweek 11.10.97

"Utterly brilliant." —PC Zone 9.97

"This game is great. I can heartily recommend it to both turn-based and real-time strategy gamers..." —Computer Gaming World 1.98

"★★★★★"
— CNET Gamecenter 10.28.97

"It's a game of nailbiting intensity and nonstop strategy." —OGR.COM 12.97



Age of Stone · Age of Bronze · Age of Iron · Age of Opinions

"One of the best of the year in any genre." —The Atlanta Journal Constitution 11.9.97

"★★★★★ ...a masterpiece." Computer Games Strategy Plus 11.97

"One of the year's best games comes from Microsoft." —Jeff Green, San Francisco Chronicle 11.1.97

"...nothing is more frightening than a row of seven War Elephants..." —CNET Gamecenter 10.28.97

"The new king of real-time strategy games." —PC Gaming.com 11.97

www.microsoft.com/games/empires

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boot

april 1998

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COMM PORT

We Always Thought Of Ourselves As The Byte Of Hot Rod Mags

boot has turned into just the computer industry version of *Hot Rod* magazine. If you are going to continue to aim your magazine at those who like to play the latest 3D games, spending whatever money they make on the hardware you rate as "Kick Ass," please discontinue my subscription!

Jennifer Zapp

Thanks for the best magazine for computer fanatics. It's like *Hot Rod* magazine for computers. I enjoy trying to get the best performance out of my machine, though I'm sure I've wasted more time tuning than I have enjoying the performance.

Mdouville

boot is destined to become like *EasyRider* was in the beginning—a no-holds-barred, Kick Ass magazine. Sure, some people won't (and can't) get it. Each of these cultures is dedicated to the advancement of its machines. PCs are designed to shred apps like there is no tomorrow! Choppers are designed to shred roads until there is no tomorrow!

Scott Tarr

Hey! There's A Shel In My Spam!

I found Shel Kimen's spam column in *boot* 18 timely and informative. I always thought replying to spam lists that offer the ability to remove yourself from that list would be a fruitless effort, so I didn't bother. Recently, I also heard that sending a Remove reply is even worse—spammers sometimes use the replies to determine whether e-mail addresses are valid! Sending a Remove can actually be the opposite.

Jeff Magill

Homemade Liquid Cooling

My AMD K6 166 was starting to suck, and I'm still waiting for the K6+3D. I figured I'd overclock. But there just wasn't much improvement going to 200. I decided to go for the gusto and look around for a liquid cooling system. Here, in Albuquerque, New Mexico, everybody looked at me funny when I asked about a liquid cooler. When I found one, it was $400, so I decided to make my own, which cost $20. It's made of the heater core of a 1974 Datsun 280Z, two hydraulic brake lines, the filter pump from a fish tank, the scary monster heatsink from my original computer, two Mountain Dew cans, a package of heatsink grease from Radio Shack, a package of fuel tank patching epoxy (the most expensive), some anti-freeze, and the power supply from my ancient 386. I have successfully overclocked to 233MHz, and am happily humming along without any problems.

Now I want to do a 12-Step for the mag.

Geoff Danielson

"It's made of the heater core of a 1974 **Datsun 280Z**, two hydraulic brake lines, the filter pump from a fish tank, the scary monster heatsink from my original computer, **two Mountain Dew cans**, a package of heatsink grease from Radio Shack, a package of fuel tank patching epoxy, some anti-freeze, and the power supply from my ancient **386**."

Free OSR2 Upgrade From Microsoft

For those of you out there stuck with Win95's ORS1 and FAT16, there is a way out of the darkness and it's free. I recently went to the Microsoft web site to upgrade my *IE 4.0* to the latest revision. After upgrading, I proceeded to install and Fdisk a new hard drive, and was surprised to find that my OSR1 version of Windows now had FAT32 support! After checking the device manager, it indicated my Windows version had been upgraded to 950B (or OSR2).

Dave Wayne

Matroxic

I'd like to see Matrox improve its failing customer support structure—poor phone access, unanswered e-mails to customer support. While its web site is nice, it doesn't offer all the answers. Matrox is shadowing itself in product awards and not rewarding those who got it there with the support other video-card companies presently provide. It's time someone calls Matrox out on its omnipotent spew.

Tim Farris

I've been hosed. I bought a Matrox Mystique video card about eight months ago, and guess what? The damn thing works no more. So I did what any raving lunatic would do, try to get warranty service. First I tried to e-mail the company and only received a notice that someone will get back to me within so many business days. It's been four months now. Second, I tried calling the retailer because according to the manual you must first go through the retailer and they are supposed to ship it back for you. The manager just about laughed in my face and said that it sounds like someone doesn't want to own up to their warranty. To make a long story short, it's been a little over four months and no response from Matrox. Its customer service is for shit and I will never buy a Matrox

COMM PORT

product again. As for my fellow computer geeks, always check out the track record of a company before you lay down your dough.

Jo Kidd

Matrox Technical Support Manager Dave White replies: *Unfortunately, we have experienced some difficulties in the past two months that have kept us from delivering quick responses to end users. In addition to changes in our technical support team, the recent ice storm disaster in Quebec left us understaffed and without complete electricity for several weeks.*

Since then, we have taken active steps to rebuild our technical support. We have increased our support staff and are continually training representatives to deliver timely and thorough responses to our customers. As well, we are redesigning the technical support section on our web site to include an online diagnostic database providing a solution to known issues in less than five minutes of connect time.

If you are still experiencing problems, we recommend you contact the dealer where you purchased your Matrox card. Since we offer dealers direct connection to technical support, you should receive a speedy resolution. Also, it may be still within the dealer's return policy to offer you a replacement or refund.

If this is not possible, contact Customer Support Group at 514.685.0270 to have the product returned and repaired. Please feel free to contact me personally (dwhite@matrox.com). I trust we can resolve it to your satisfaction.

Con 56K

USR tech support is useless. I paid for the 56K upgrade and that was a waste. I never connected at better than 26,400, and the upgrade did not improve this. I removed the "prized" USR, installed an Acer 33.6, and connected at 33.6. My phone lines are three-years old and Bell South only supports 14,400 voice and 9600 data. Don't blame Ma Bell for USR's hype and lack of support for a chip burned at 24K.

John Whitehurst

56K? I just wanna get 28.8! I have a USR 33.6 modem and I connect to the Louisville, KY, IBM Global Internet 33.6 line. Very few people really use IBM in my area, and I am using a brand new line installed by Bell South and a line noise filter. The only speed I can connect at is 26.6Kbps, which is horrific! I want to at least reach 28.8 on my 33.6 modem dialing into a 33.6 line! By the way, all you people complaining about getting 33.5 or 40.0 instead of 56Kbps should just be happy you can reach something other than my sub-28.8 speeds!

Matthew Jolley

Pro 56K

It amazes me that anyone would invest in a technology that doesn't work on their system. I wouldn't waste my money buying an old MacOS to install on my PC, and I wouldn't buy an X2 without knowing if I have the proper phone lines, or if my ISP can connect at that speed. Before buying my X2, I researched. I found a number that checked phone lines and made sure they were up to "speed." U.S. Robotics set it up at 1.888.877.9248 (log in as "line test" no quotes). It works for both K56flex and X2. It only tests the line, after all. You don't even need a 56! Then I bought the modem.

Know what you're dealing with before throwing away your money to impress the neighbors.

Steve Pohore

I'm a tech-support person for a modem manufacturer that produces 56K modems, and I'd just like to set the record straight on all the criticisms of 56K modems. I keep hearing people talk about these modems being a "scam," when it's apparent these people don't realize the functionality of a 56K modem. Correct me if I'm wrong, but I don't think any company that produces 56K modems will say you actually get 56K connect rates. Connect rates aren't the benefit of 56K modems.

The first time I called in to AO(hel)L with my 56K external, I connected at 24,000 bps. But guess what? I downloaded a file during that connection averaging about 5K/sec. My brother has a local ISP and gets download rates of 10K/sec sometimes. With my old 33.6, I never got anywhere close to that, usually averaging about 2K/sec. People call me whining about how their new modem only connects at 40,000 bps, or sometimes 33,600. Get a clue, people. No one is scamming you about 56K modems, you're just not paying attention to what they are supposed to do. Throughput speeds, not connect speeds, are the advantage of 56K modems.

Chris Brown

"No one is scamming you about **56K modems**, you're just not paying attention to what they are supposed to do."

Rattle And Hum

In *boot* 18 Comm Port, reader Dan Hull explained why I hear a hum from my SB32 PnP. Is there some converter that would convert the SB speaker output to line-level output? I'd even breadboard a circuit, if needed.

John M. Wildenthal

bootReader Michael Oxner replies: *One of your readers complained about the "gold standard" that he thinks exists among soundcards, saying that you need a "Sound Blaster Gold" to play sound through your stereo from your soundcard or else you'll get a loud hum instead. Not quite so.*

I have the same, cheapo-deluxe SB16 soundcard and had the same hum when I first connected it to my stereo. This is called a ground loop. The two units are running at a different potential, and therefore the hum exists at 60Hz, same as the oscillation frequency of the power coming from your wall socket. To solve this, you have to buy (or build, it's easy and cheap) a ground loop isolator. Once you have this installed, everything will work just fine.

I used two 1:1 audio isolation transformers that I bought at Radio Shack and a film container from a 35mm film canister. Total cost, $12.00 CDN. Pretty cheap fix for good sound.

All The News That Fits

Reading the paper version of the bootWire, it becomes distressingly obvious just how long it takes to bring an issue to press. Ouch! Here's an idea: Admit the magazine is not the right place for breaking news and just concentrate on keeping the info coming online. For those of us who subscribe to the bootWire online, the paper version adds no value, and let's face it, every bootReader should subscribe to the bootWire listserve. Who needs month-old breaking news in the age of the net?

Alan Robinson

Editor-in-chief Brad Dosland replies: *We agree that every bootReader should be subscribed to our online newsfeed (**www.bootnet.com/bootwirelist.html#subscribetobootwirelistserver**), but the reality is that only some 20% of our total print readership is actually tapped into this vital source. For the rest of our readers, and those who simply miss a day's posting, we try to provide a capsule view of the most important stories of the month in our print version's Nuggets section, and we devote the bulk of our news pages to a more in-depth analysis of the key stories broken online. We believe this approach leverages the best of both worlds.*

Heathermania

I confess. I caught "Heathermania"! When I pick up *boot*, the first thing I check is if Heather Walton has submitted a tech question to Comm Port. Keep us up to date on what Heather does next.

Rodan, Heather groupie

Heather Walton was having swap file problems with games (Comm Port, *boot* 18) and wanted to know if more RAM would help. Well, this tip could've saved her $150 on that extra RAM. If you're running Win95, you can manually change the size of the swap file so that it doesn't constantly unload and load.

Go to Control Panel->System->Performance->Virtual Memory. At the Virtual Memory window, click "Let me specify my own virtual memory settings".

Make one huge swap file that doesn't need to be read to during laborious system commands. First, enter the same number in the Min and Max boxes. The safest way to determine how much to use is to multiply the amount of RAM you have by 2.5. In Heather's case, she should enter 80 for the min and the max.

Now exit Windows and reboot. This tip

works only if you aren't worried about disk space. You can even make the file larger if you wish. The secret is to keep the min and the max the same.

Thomas A Duplessie

bootReader Heather Walton replies: *I saw all the questions about my letter "RAM Limits" on bootNet, and I may have some answers. I do still use all 80MB I upgraded to. Even though my HX-chipset motherboard only caches 64MB, it does not affect system performance at all—except for those benchmark results. I prefer to test with real-world applications such as games. Like I said, my swap file used to go constantly with 32MB of RAM, both during the games and after shutting back to Windows. It was very annoying, and 80MB of RAM solved this problem completely. So what if it only caches 64MB. I believe my 80MB is better then just 64 with games such as* GLQuake, Quake II, *and* Jedi Knight. *bootReaders: do not hesitate to upgrade your RAM to as much as you can afford. The games are so much more playable without freezing up due to the swap file.*

The Bleeth Shall Inherit The Earth

I've subscribed for a little less than a year now and I've noticed that much of the hardware you review is priced out of my reach. The systems you review are pretty sensuous, incredibly desirable, but let's face it: We can't all be married to Yasmine Bleeth. Most of us have Pam Dawber.

"We can't all be married to **Yasmine Bleeth**."

Sure, Pam Dawber's cute and everything, but she's no Yasmine Bleeth. We have to realize that we can never have Yasmine; we have to be satisfied with Pam Dawber, who is really a fine woman in her own right but just doesn't have the hardware.

Take, for example, the Intergraph TDZ 2000 you reviewed in *boot* 17. Sure I drooled when I saw it. I ached. I yearned. But when I saw the price tag, all I could do was glance to Pam Dawber on my desktop and be resigned to acceptable performance instead of kick-ass performance.

Maybe you guys could review some Pam Dawber systems. You know, systems that guys like me can afford. Perhaps you could even put a special tag on those articles so I know better than to lust after something I can never attain. You could put Yasmine Bleeth's picture right at the beginning of some articles so us John Does would know immediately that this was out of our league.

Ray Geroski

Executive editor Jon Phillips responds: *Is your machine Pam Dawber circa early 1980s or Pam Dawber 1998? (Maybe your situation isn't so bad.) We see your point, Ray, but boot celebrates Pure PC Power, not Pure PC Mediocrity. Technology moves in a single direction: forward. It would be redundant to review P200s in 1998—we broke open those babies last year. The Intergraph TDZ 2000 is an extreme example. In fact, we just reviewed a kick-ass 333MHz Pentium II system that costs less than what you might've paid for a run-of-the-mill P200 MMX machine this month last year. Indeed, technology is getting cheaper. So don't let Pam Dawber get you down—someday you'll find your Yasmine Bleeth. Of course, that's easy for me to say—I'm doing Alicia Silverstone!*

<sass>WYSIWYG</sass>

Scott Dahlstrom (Comm Port, *boot* 18) can take his WYSI and shove it up his WYG! Go to any self-respecting site, you won't find a bit of WYSIWYG HTML. Even MS and Netscape don't use their own products! WYSIWYG web editors are trash. To fix the pages, you need to know HTML, and once you understand HTML, you don't want to use those crappy programs. <ducttape> Scott's mouth</ducttape>.

Quasar

Just my two cents on Shel Kimen's *boot* 16 column: WYSIWYG sucks! Notepad or HomeSite are best. People always complain that you can't make 2,000-page sites with Notepad. BS! I've made sites with 3,000 pages via WordPad! These people must not appreciate the fact that big sites use templates. They think templates must only be available in WYSIWYG editors.

Wrong!

The code those editors put out is hard to read. With the HTML I write, I know everything's going to look like in does my head, and I can fine-tune things until I'm satisfied. Old coders like me know the tricks of the trade when it comes to HTML, and we get the job done.

Mike Shafer

Postcards From The Edge

Why the hell are *Myst* and *Riven* so high on the sales charts? These titles truly suck and are boring as hell. People see the colorful pictures on the box and think: "Wow! This has to be good with these graphics! And look at those low system requirements!" Either that or the sales charts are rigged. I believe the latter because I know only one person, out of the countless computer freaks I know, owns *Myst*, and he says he hates it!

HakLord

IPX Gaming Network For Nothing

One of my favorite multiplayer games is *Quake*, particularly *GLQuake*. However it only accepts IPX and TCP/IP multiplayer modes. I've connected my two computers through Direct Cable Connect. All the literature I've read says this is a one-way-only connection. Guest has access rights to host but not vice-versa.

It ain't so.

As long as you're connected using DCC and the common protocol is IPX, you have a playable IPX network. With *Quake*, I get almost zero lag.

Another perk to this network is that the host does have access to the guest. Open up an application such as Word and go to Open File. In the File name dialog box, type the UNC of the guest and the folder you wish to open (i.e. \\laptop\c\mydocuments) and the directory appears.

This method doesn't allow the host to map network drives, but there's a fix for that. Throughput seems to be at .lMbps to lMbps. To map network drives on the host for the guest, you must install a second adapter in the network control panel. Mine happens to be an AOL adapter. After it is installed, uninstall and reinstall IPX/SPX so that it is bound to the AOL adapter. Now when you start Win95, you'll be prompted for a network login name and password. As long as no password is needed for DCC, none needs to be entered.

Actually you can use TweakUI to log on for you.

Now you can map the guest's drives and resources just like a real network. I hope this helps gamers at odds with games that don't support certain multiplayer options.

Erik Read

Quaking In NT

In reply to the Comm Port letter "No *Quake* For NT" in *boot* 18, Yes! You can run DOS-based *Quake* in NT. Before there was *GLQuake*, there was *WinQuake*. *WinQuake* is a little app that you drop in your *Quake* folder instead of Quake.exe when you're on an NT machine. *WinQuake* makes valid calls to the video subsystem instead of to hardware, and you can run it full-screen or in a window. I was fragging people on NT running *WinQuake* before I knew what 3Dfx was. You can get *WinQuake* at redwood.stomped.com/ in the essential files section.

Pete Bielek

Pay To Play

Accolade's free upgrade patch for *Test Drive 4* is the most commendable, upstanding, and righteous thing a game developer could do for the gaming public. Electronic (F)Arts and all of its subsidiary companies would do well to emulate this trend. As it stands, we know who runs the show at EA. The marketers and the bean-counters!

And I'm willing to bet my fat aunt Sally's moustache that we'll be paying another $50 for the multiplayer add-on to *Wing Commander Prophecy*, a feature the game was supposed to ship with. In fact, Origin's 1997 catalog still advertises multiplayer and cooperative modes for *WCP*. Does that constitute fraud? It's obvious the accounting department at EA wanted a chunk of the "Christmas cash" regardless of the fact that the game needed more time. Does the term "bait and switch" sound appropriate? EA would be heroes if they put out a free multiplayer upgrade to *WCP*. Psygnosis did it for *Wipeout XL*. Considering

COMM PORT

EA's current trend with charging full price for minor upgrades (*Need for Speed 2* and *Privateer 2*), I doubt we'll see any generosity from them.

It might suck to wait and wait and wait for a game, but wouldn't you rather get a game that does what it said it would?

I'll not pay for another EA title if it doesn't stop making us pay for minimal upgrades. I urge other gamers to follow suit. And now, I'll step down off the soapbox!

Scott Myers

Senior editor Andrew Sanchez replies: *We hear your pain and anguish, fellow bootBrother. It is unfortunate that games such as* Wing Commander Prophecy *did not ship completed. While we didn't mark them down too much for it—after all, the main* Wing Commander *series was always a "you against the alien world"—we know many are pissed.*

From what Origin has told us, there are plans to do a multiplayer Wing Commander *game using the Vision engine, but it will be a free-standing product that you'll have to buy. Hopefully, it will be more of a* Wing Commander Armada*–styled game, as opposed to straight* Prophecy*-esque dogfighting.*

The Croft Super Show

I didn't get upset when you pooh-poohed my motherboard. When you dogged my monitor, I just laughed. And when you said my Monster Graphics board was going to be obsolete in three months, I shrugged my shoulders. But now I must stand up and be counted. How dare you give my beloved Lara Croft a 6? Please give Sean Downey 10 lashes for overlooking the true meaning of the game. I couldn't care less about polygon collision detection. I just want to back her up in a corner and watch her carefully rendered boobies bounce up and down. What's wrong with you guys?

Matthew J. Pratt

"I couldn't care less about **polygon collision detection**. I just want to back her up in a corner and watch her carefully rendered boobies bounce up and down."

Fear Of A Black Processor

I use a Dual P-Pro/WinNT 4 system for 3D/2D graphics despite my smoldering resentment of the Wintel regime. It seems the Pentium II is just being thrown out by Intel to collect money from its users until it comes up with something actually new and improved. Although I will spring for the P-Pro MMX upgrade, I am extremely leery of the nefarious schemes of the Wintel juggernaut. I'm waiting steadfast before buying a new system, and I'll probably buy a new graphics card instead.

Roughly, when will the true sweet-spot of new system acquisition present itself for someone like me?

Curtis Harvey

Executive editor Jon Phillips replies: *There is no obvious sweet spot, Curtis, and you will never be truly satisfied. Whether you buy a new CPU today or a year from now, Intel (or AMD, or the Next Big Thing) will always have a better, faster, stronger processor waiting in the wings to frustrate you. Intel's business model is based on continuous forward development. It hooks users like the opium trade, and once you're addicted, you're a sucker for life.*

Staight From The Source

After reading Alex St. John's idea for DirectOS, I was wondering why someone should tell the Windows CE people about this. Didn't you realize that it already (almost) exists? Last time I checked, there as an operating system called DOS. It wasn't exactly what you asked for but... It's small and simple, it has plenty of function hooks to play with, it's backwards compatible, it could be easily fitted with a better FS (Fat32?), it could be equipped with an updated kernel with a flat memory model, and it could be equipped with a very simple graphical/3D API (hey, it's Windows 1.0, with 3D!).

Before it did preemptive multitasking, Windows did cooperative time slicing. This is pretty much what St. John was talking about. A "master" or primary app (such as your favorite game) only releases a small time-slice out to other system functions (TCP stack, clock, etc.). I know St. John wanted drivers attached to each app, but that's asking a lot from game developers. DOS game developers do that now, but the VESA VBE is too slow to be useful, and creating a 3D driver for each app would be too much.

Now, integrating an OpenGL engine to the OS... that would provide a 3D API.

So now all we need to do is take DOS and give it a real FS, a flat memory model, a simple graphics/windowed API, and an OpenGL engine, then write well-behaved apps that don't do stupid Windows-like things.

So does anybody wanna pour over the OpenDOS source?

Anthony Iannone

Columnist Alex St. John replies: *Part of the intended humor in the article is that the Acronym for DirectOS... is DOS. DOS does have several practical problems—being 16-bit is a major one, and not having the idiot-proof file system I described. Also, I presume that DirectOS has a driver model, so third parties can develop standard drivers for it. Those would be the drivers games shipped with, not ones designers had to make themselves. It's the same model we chose for DirectX: the universe makes the drivers, and each game ships with the versions it's been tested with. I'm inclined to think that Linux might be a stronger starting point.*

What I meant by telling the CE guys is that Windows CE has many of the correct characteristics, and it's being ported to the next generation Sega with DX driver support. The trouble is, Microsoft thinks CE is a great OS for handhelds and car dashboards. Microsoft doesn't understand that with a little cleaning up it's very close to a great consumer OS, possibly a much better consumer OS then the bloated monstrosity they're making now (Win98).

And I'd love to see the OpenDOS source.

Fool's Quest

Why would any fool want to put two Voodoo 2 cards into one machine?

Billy Mills

Senior editor Andrew Sanchez replies: *Why? Why ask why?! For massive power, that's why! Imagine playing games at 800x600 or 1024x768 locked in at 60fps—under any circumstances! Will Riva 128 do this? Nope. Vérité V2200? Nope. Not even Intel's mighty i740 (reviewed on page 65) can attain this Herculean feat. But dual Voodoo 2s operating in SLI can guarantee arcade-destroying performance in your desktop PC.*

Makin' Flippy Flop

When will the Sony/Fuji replacement for the dogged floppy drive ship? You know, the one that's faster than a Zip, twice as big, and still manages to read original 3.5-inch floppies? I just fried my floppy drive and I want one.

McKay Stewart

News editor Bryan Del Rizzo replies: *According to Sony, the HiFD—a 200MB floppy drive that is backward compatible with your current 1.44MB floppies—should become available in late spring. No formal pricing has been announced, but you should guesstimate that it will fall somewhere under $200. We loved the SuperDisk, but sadly, it went nowhere. We just hope the same fate doesn't befall the HiFD.*

Feelin' Centered

You ripped the NEC 6200MX laptop (*boot* 12) for various reasons. I noticed that you disliked the fact that the 13.3-inch screen is not really centered. Last month, you gave a the Micron Transport XKE 233MHz a 10 out of 10, but the picture of the laptop was cut-off. Is the screen on the Micron uneven too?

Rahul Sood

News editor Bryan Del Rizzo replies: *No! But due to space constraints on the updated review, our assistant art director got all fancy-schmancy on us and cut off the corner. Be sure to check out this month's notebook dissection feature on page 42.*

Assistant art director Sherry Monarko replies: *Fancy-schmancy my ass! I had to shove the image up in the corner so our long-winded Canadian news editor could jam in 50 extra words.*

COMM PORT

PowerPR

I just read the interview with Hossein Yassaie and Charles Bellfield in Lip (*boot* 18), and all I can say is "what a complete pile of bullshit." Once again the PowerPR crew from NEC/Videologic would have us believe that they are only moments away from releasing the fastest 3D accelerator known to man. The two of them should have rehearsed their answers a bit more thoroughly before the interview. Answering questions with questions and basically lying about the performance of their hardware has become almost second nature to this gang. When will NEC realize that the performance of their design will sell more hardware than the silly games used by their marketing department ever will?

Big Dave Short

PowerVR's Bellfield says, "I personally believe that lighting and texturing of the PowerVR PCX2 of *Quake II* is far superior, for example, than the 3Dfx version, whose use of color lighting looks way over the top." He is definitely on crack. Please perform drug tests on future interviewees, I don't want opinions from crackheads. To even say this, much less mean it, indicates that he is at the very least a moron. Colored lighting is implemented by the software, not by the hardware.

Bellfield also says, "Hook is comparing a $99 PowerVR-enabled product to those from our competitors' that range from three-to-ten times that retail price, and that will not be available for three to six months." Excuse me, but where has Brian Hook ever compared a PowerVR to a $1,000 piece of hardware? The Obsidian boards? Anyone with half a brain knows he only uses Obsidian boards for fun and for a reference point. For purposes of consumer-level cards, he uses Voodoo, Riva, Vérité, etc. So far as I know, he actually compares the $99 PowerVR to the $150 3Dfx chips or $150 to $200 Riva 128 and V2x00 chips. The V2100, for example costs less than the PowerVR and spanks it in every way. This means that in actuality, Hook is comparing the PowerVR to competing chipsets that cost either about the same or at most 2x as much.

And every one of them spanks the PowerVR.

And in March, Diamond will ship the Monster 2 for $250. That fire-breathing, ass-kicking piece of hardware will only cost 2.5x as much. You're telling me Matrox is gonna sell m3D's for $50? I don't think so. The PowerVR is dead. These guys are smoke and mirrors, or to put it another way, they are full of shit.

MJ

I'm sure you've gotten quite a response concerning those two jokers from Videologic and NEC already, but I felt I had to add my two cents. I have never read a more evasive interview in my life. These guys must be taking lessons from Bill Clinton. Every answer seemed to be either a half-truth or just downright ridiculous. In particular, the chip they claim will better Voodoo 2 performance for around $100. How long will we have to wait for this? If they pull this off within six months of Voodoo 2's release, I will eat all six pages of this article. If it comes any later, they shouldn't bother because 3Dfx will have another chip that will embarrass them even further.

Rick Lowes

It was totally kick ass that you followed up your 3Dfx interviews with a PowerVR interview, but then you utterly wimped out when it came to the folks at PowerPR [sic] cheating on the JPA benchmarks. You let them off with some mumbo jumbo about beta drivers and standing by their numbers. If I didn't already know the story, I would have had no idea what you or they were talking about. Everyone who followed what happened knows that PowerVR blatantly cheated on the benchmarks, regardless of the pathetic excuse about being "representative of final drivers." *boot* was my one shining hope of nailing these guys to the wall on this, and you blew it.

As a final note, I find it interesting that despite having cheated on the 3D benchmarks to inflate PowerVR's score, Bellfield later has the nerve to take the holier-than-thou attitude that they do not spend time optimizing for benchmarks like their competitors. Well, I guess you don't need to optimize for benchmarks when you can just flat-out code your drivers to report false numbers.

Chris Ciccarello

"When will **NEC** realize that the performance of their design will sell more hardware than the **silly games** used by their marketing department ever will?"

News editor Bryan Del Rizzo replies: *Interviews are a tricky business. We try to present a balanced Q&A so you, the reader, get a feeling as to what these people are really like. You don't need us to nail them to the wall... they did a fine job of that themselves. The whole point of our interview was to let PowerVR tell their side of the story, and ultimately their answers reflect loudly on their company, business strategies, and products.*

For the record, we weren't too happy about the content in the interview. VideoLogic and NEC had promised us a wealth of information before the interview (including new product specs and official "comment" on our 3Dfx interview with Scott Sellers), but when it came time to talk, they clammed up. Our original interview had over two pages of "no comment," "we can't comment on that," and "we aren't allowed to discuss that" answers that we had to edit out. In fact, we had to do a follow-up interview after we got back on U.S. soil just to get what skimpy meat and potatoes we did manage to pull out of them.

But obviously, savvy boot *readers can read between the lines.*

...He Loves Me Not

Just perused your trial issue... Why would you expect anyone firm of mind and wishing to oneself and one's children well [sic] to allow this "kinda-outta-reapin'-kickass" pile of magotry in one's house? This writing style should be as illegal as it is to defecate in public. In fact, being a pure, unprovoked deviancy (rather than an inappropriate fulfillment of a legitimate call of nature), it has to be worse. Perpetrators should be hanged, drawn, and quartered, after which a public holiday may be declared—to celebrate such a good riddance. Won't ya'll drop kick-assin' dead, you creeps.

Len Belyakov

Cut, Copy, Paste

In our review of *Falcon 4.0* (*boot* 18, p.69), we said it was the first combat sim to support air-to-air refueling. Actually, *Tactical Fighter Experiment (TFX)* was the first sim to do so.

Yup, we got it wrong and we know it. The price for the Sony MX-T4135 home theater system shown in the February 1998 edition of Pure Lust was WRONG. We priced only the sound system. The actual price of the whole system is $3,599.95. We regret the error and any confusion it may have caused.

In our modem roundup (*boot* 18, p 79), we state that *Trio Communications Suite* does not include an uninstall program. But as a clever bootReader pointed out, it does. If you want to uninstall, insert the CD again and select "install" from the *Trio* menu. You'll get a screen (eventually) that gives you four options: typical install, custom install, modify installation, and exit. If you go to modify, there is an option to uninstall the *Trio* package.

Eagle-eyed reader B. Armstrong noticed a discrepancy between two reviews in *boot* 18 discussing the Diamond FireGL video card. In our review of the card on page 82, we state that the max 24-bit resolution is 1280x1024. But in the Micron Powerdigm XSU review on page 72, we state that the video subsystem maxes out at 1024x768. This video subsystem comprises a FireGL video card and a Hitachi 19-inch monitor. That particular configuration could not run *3D Studio Max* at 1280x1024 in true color. Therein lies the conflict.

In *boot* 19's cover story on Deschutes, we mistakenly printed in the Deschutes processor comparision chart that the Slot 1 Deschutes processors will have 1MB and 2MB of L2 cache. This is incorrect—512K is the maximum limit. b

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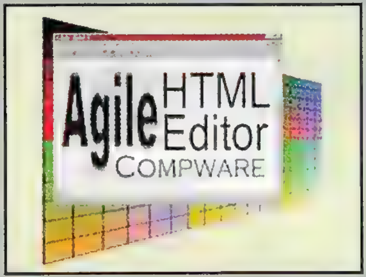

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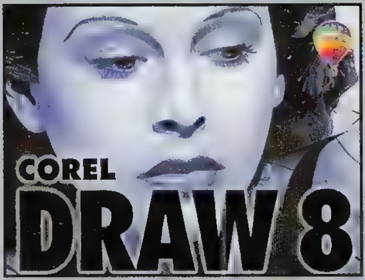
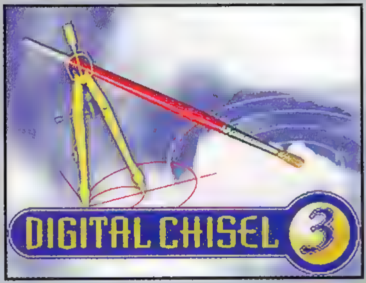
This is a 30-day trial version. From Compware.

Bryce 3D *Bryce* is ideal for anyone who wants to create 3D images but has been intimidated by the cost of 3D applications and the hardware required to run them. Bryce breaks the price barrier, bringing 3D capabilities to the desktop. This version of *Bryce 3D* has been save-disabled and restricted in various ways to prevent software piracy. From Metacreations.



CorelDraw 8 *CorelDraw 8* is a complete suite of powerful graphics applications and supporting utilities that delivers the latest in design technology, including productivity enhancing features, interactive tools, and support for Internet publishing. It includes Enhanced CorelTutor, 40,000 clipart images and symbols, 1,000 photos, and 1,000 TrueType and Type 1 fonts. This is a 30-day trial version. From Corel.



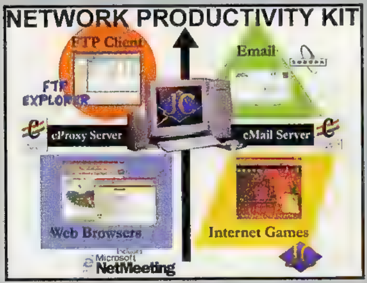
Digital Chisel 3 *Digital Chisel 3* is the first all-in-one authoring tool designed especially to meet the needs of education. The look of the program and its functionality can be customized for different ages and skill levels. This is a 30-day evaluation. From Pierian Spring Software.

The Interstate '76 Arsenal

The Interstate '76 Arsenal *The Interstate '76 Arsenal* includes the Gold Edition, the award winning game now optimized with 16-bit 3D hardware acceleration, enhanced graphics and difficulty levels, an optimized engine for increased performance, new cars and weapons, and other enhancements. From Activision.

MediaStudio Pro
VERSION 5.0

MediaStudio Pro *MediaStudio Pro 5.0* is the fifth-generation of Ulead's award-winning nonlinear video editing solution for Windows 95 and NT 4. With this version, they've have introduced increased quality and improved frame level control, video painting (rotoscoping), and character generation tools that will help you produce professional quality videos right on your desktop. This is a 30-days trial version. From Ulead.



Network Productivity Kit Spouse.Net, the connectivity tool for the domestic PC user, allows two PCs to share a single Internet connection over one modem using a LAN network. Both PCs can browse the web, manage separate e-mail accounts, download data, use Newsgroups, Telnet, and more. From JC Research.

QuarkXPress

QuarkXPress 4.0 *QuarkXPress* is more than just a page-layout software. An integrated publishing package, *QuarkXPress* lets you combine pictures, text, typography, writing, editing, and printing — in one application. From Quark.

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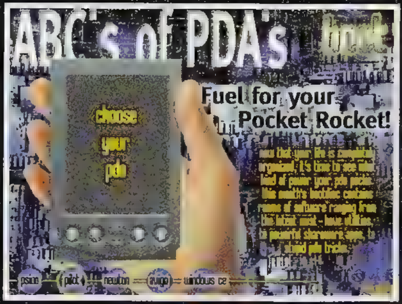
The ABCs of PDAs Part II

Pull out your PDA and hook it up, 'cause we've gathered over 100MB of the best software you're likely to find. Whether you use the Psion Series 5, the Pilot or Palm Pilot, the Newton MessagePad 2000 or 2100, the Avigo10, the Philips Velo-1, the HP300LX, 320LX or 360LX, the NEC Mobile Pro 200, 400, or 450, the Compaq PC Companion C120 or C140, the Casio Cassoipeia A-10 or A-11, or the LG/Goldstar GP40M, look to the bootDisc for all your software needs.



No CD? We Can Help

Fear not if you're holding a naked edition of *boot* with no *bootDisc* CD-ROM. You can subscribe to the full magazine/CD-ROM bundle, and even order individual copies of the *bootDisc*, by calling customer service at 800.274.3421. Each month, the *bootDisc* is stuffed with game demos, application demos, utilities, and patches–so don't miss this treasure trove of valuable software.

AVIGO SOFTWARE

Avigo Manuals
Game 1
Game 2
Mine Field
Number Puzzle
PS6155 Address to CSV File Converter

NEWTON SOFTWARE

NEWTON SOFTWARE FOR ALL MESSAGEPADS

IrDA Printing Enhancement Package Upgrade
Mouse v1.1
NEWK 1.0
Newton Press 1.1 Update
Newton Backup Utility v1.0.1
Paperback 2.0
Stuffitt Expander v1.0
StyleWriter Printer Package Upgrade

NEWTON SOFTWARE FOR 1.x MESSAGEPADS

ExtraPkg: Newton Package Extractor
Newton Package Installer v1.1
PackXTract 1.0
Schedule-2-Go
WinNewt 1.11
XPkg v1.0

NEWTON SOFTWARE FOR 2.x MESSAGEPADS

ModemBridge v1.5
Newton Toolkit 1.6b5
Newton Internet Enabler (NIE)
Package Buddy
PageNOW!

PILOT SOFTWARE

Abroad! 1.3
Address Book 1.3e
Agenda 0.61b
Airline #'s & Websites
AlarmHack v1.1
ALCALC: Al Weiner's Calculator
AportisDoc
AWK Quick Reference
Battery Hack
Bill of Rights
BioChart
BioRhythms
Blackjack 1.0
BPM2Delay v1.2
CalConvert for documentation
Calculator Hack
CAS Library Runtime
Chipmunk Tiny Basic
Chronos
ClipHack v1.1
ClockHack 3.0
Commute
CookBook 1.0
CoPilot
Countdown
Date Calculator, v0.0.5
DeskPilot
DigiPet World
DinkyPad
DirectLink 1.0
Document Loader
Drink Mixing Guide
E-Texts for the Pilot
EbonyIvory 1.0
English-Spanish Dictionary
Explorer
Fighter Pilot Software
Fill Up v1.1
FlashHack 1.0
Font Display
FretBoard v0.9
Gamer's Die Roller
Generic Conduit Manager
GetDirections
Hand Fax Demo
HandMap1.3e
Hand Stamp Pro
HI-NOTE
Holiday Planner v1.2a
Hot Sync Update
Hourz Pro
HTML Reference
HTML Suite
Image Creator
Image Compression Manager 1.0
Image Previewer
Image Viewer
JFile 2.2
JFile Converter 2.0
JShopper 1.4a
Kar Kare Vehicle Tracking Database
Language Dictionary
LaunchPad 1.11
ListMaker 1.0b2
Loan Wizard Pro
Lotto v1.0
MakeDoc Text Converter
Memo PLUS
Menu Hack
Metronome
Mobile Account Manager v1.2
My Little Buddy
NetNews
New Folder
Online - VT100 Emulation
Outliner 1.2
PAL 1.31
PalmJongg
PalmMap 1.0
PALM OS v2.0.4
PalmPilot Desktop 2.1 Upgrade
Palmscape Preview
PalmTelnet 0.31
Palm YATS (Yet Another Time Synchronizer)
Photo Album with Grayscale
Pilot Convert 2.0a
Pilot File Dumper
PilotMark 1.0
Pilot OS Update 1.06
Pilot StopWatch v1.10
PocketSynth v1.23
PocketChess 1.0
PowerHack 0.93
PPix
Programmer's Calculator v2
PV Poker 1.0a
Pylon Up-Linking for Lotus Notes
Quick Tip
eDo
SafeHack PalmPilot 1.0
Secret 15a
SelectHack
Shopping-List v1.4
SilkHack v0.2
Smartshop v1.1c
Sun Compass v1.0
Tarot Assistant
TC Calc
TealDoc
TealEcho
TealGlance
TealMeal
TealPaint
Thesaurus
Thought Mill
Tide Tool
Timecode Tool v.1.0
TimerZ
Today
ToDo PLUS
Top Gun Telnet
Trans AOL
Translate v1.11
Translation Dictionary
Tricorder VII
U.S. Constitution
Walk Thru
ymcal 0.3b1

PSION SOFTWARE

3T Simple File Manager
5Time To Do and Task Manager
5Xpense
8bp - a banking program
Ascii Calculator
Atomic v1.2
Backlite+Plus v2.02
BatCheck
BioBase
CallCalc v1.00
Casino BlackJack v1.1
CharMap 1.0
Concept!
Connect 4 v1.1
Contrast Manager
Converti
Convert5 Pro
Crackshot v0.8
Dialer
DP5Bank
Dungeon v1.1
EasyFax
Easy Note 1.3
Encrypt-It! v1.0
Extended ToDo Manager v1.1b
File Zip & Unzipper v1.00F
Form Calculator 1.0
Fortune v1.0
FreeCell v2.02
FrotzS5 v1.2
Fuel Consumption Manager v1.0b
Global Find v1.1
Haunted House
Hearts v1.1
HERMES
HexCalc
HomeBank BETA 1.2
Home Inventory Program v1.0b
Home Inventory Program v1.0a
Invoice Manager 1.4.2
Jongjong32 v1.18
JWIN for EPOC32 v1.05F
KeySwitch
LightBox v1.0
Light Cycles v1.1
M5Logger v1.1
MasterMind
MBMView v1.21
Memory5
Message Suite (1.00F)
Message Suite v1.00F
MM version 3.1
MyCar
OPL32
Personal Accounts Suite S5Bank v1.1b
Piano Helper
Piano, Tuner & Metronome
Plan5 version 5.0
Pocket Packet
Poker
Psi-Mapper-Great Britain 5.3
Psi-Mapper-London 2.3
PsiBank Bank Account Manager
Psion screen saver
PsiTris v1.13f
PsiWin 2 Microsoft Office 97 Plug-in
PSolly
Pssst v1.2
Robo Dungeon v1.0
RPNCalc
S5EVENT v1.2
S5Notes Jotter v1.0b
S5UTILS - Utility & Conversion v1.05F
S5Utils Utility & Conversion v1.05F
SeaStrike 5 v1.02
Shanghai v1.2
Shortcut v1.0
Sleeper 3.0
Sleeper v3.0
SolarMap v2.0
Solitaire 5 v1.1
Splitz & Joinz
StartUpPlus v2.07
Statistics v1.0
StopWatch v2.1a
Super Puzzle Engine
Swapper v1.02
SwitchTask v2.00
Thankyou v1.0
Thesaurus Link v1.04
Thesaurus Link v1.07
Time Plan 1.1
Trivia v1.3
UK Pocket Directory v1.4
Utilities v5.03
VacTrac5 Version 1.0.1
War v1.0
Web World v5.00a
Wine Manager 1.2.1
WorldTime v1.0
XChange 1.1
Yatzee V2.1a

WINDOWS CE SOFTWARE

WINDOWS CE SOFTWARE FOR MIPS & SH3

MIPS & SH3 Software
Animals Wallpaper
Backgammon
Blox
CalliGrapher
Database Backup
Desktop Clock
Dial Tone Sounds
Drop4
DSound sh3
DSound mips
FaxPlus
Financial Calculator
H-PC Explorer 1.1
Handheld PC File Converter
I-Ching
Inscribe
Keep Track
Martians
Mfcwce.dll sh3
Mfcwce.dll mips
Mipssh3.txt
Musical Instruments Wallpaper
Pocket CrossWord
Pocket Change
Pocket MBA-Calculator
Pocket Dial4Me
PocketSwap
Quote Ticker Bar
Star Wars Wallpaper
VisualCE
WyndMail

WINDOWS CE SOFTWARE FOR MIPS

CometDefenseSetup
Daughter In The Box
dtopmips
invaders
Jimmy Quick Menu
LifeMIPS
Master
myftp1b1mips
opaddemo
QTZMips
quicktext_demo
Sabotage
Space Invaders
TankZone 3D
VGBCEm

WINDOWS CE SOFTWARE FOR SH3

BASICE
Boomeran
CometDefenseSetup
Daughter In The Box
dtopsh3
invaders
Jimmy Quick Menu
LifeSH3
ppaddemo
QTZSH3
quicktext_demo
Sabotage
Space Invaders
TankZone 3D
wiha_a21sh

NUGGETS

S3 Acquires Coveted Exponential Patents

boot has learned that graphics chipmaker S3 has won the cloak-and-dagger auction for the much sought-after Exponential patents. It was previously believed that Intel beat out bidders such as AMD, Cyrix, and Digital for the rights in an attempt to protect its Merced technology.

The Exponential portfolio of 45 patents covers the key technologies behind a high-speed 64-bit microprocessor capable of running both CISC and RISC code, which is also the goal of Intel's Merced chip, which is expected in 1999. The Exponential patents were filed before Intel's, so they would hold precedent in any infringement suits.

It is unknown what S3 intends to do with the patents (for which it reportedly paid anywhere from $5 to $10 million). The company is losing the battle on the 3D-accelerator front and is ill-prepared to go up against mighty Intel in the CPU market. One possibility is that S3 may leverage the "Prior Art" patents to get licensing fees out of Intel. More likely is the option of S3 building an integrated chip to compete with Cyrix's MediaGX.

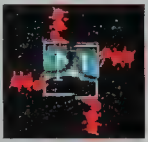
Intel Gives Cyrix License To Clone

In a move that startled even the most battle-hardy bootEditors, Intel and Cyrix have resolved a patent infringement lawsuit that—get this—gives Cyrix access to all of Intel's patents, allowing the company to engineer Pentium II clone chips via reverse engineering, without the threat of lawsuit.

The cross-licensing agreement doesn't cover all of Intel's Pentium II intellectual property, especially since Intel was smart enough to protect many of its design features by designating them as official "trade secrets."

Despite this recent victory, Cyrix's Big Daddy—National Semiconductor—has admitted it missed its revenue and earnings targets for the latest quarter due to manufacturing shortfalls of its MediaGX 233MHz processor.

Netscape Considers Selling Off Parts



Reeling from fourth-quarter losses and facing relentless competition from Microsoft, Netscape Communications is considering selling portions of its company, the *Wall Street Journal* recently reported.

At press time, Netscape was having "serious discussions" with America Online, Sun Microsystems, Oracle, and IBM, all of which have a vested interest in seeing Netscape continue as a thorn in Microsoft's side.

There's no timeline for any buyouts or specifics on the situation other than a rumor that AOL is interested in purchasing Netscape's web site.

HP To Port Java To Merced

Hewlett-Packard has announced it will port and optimize Sun Microsystems' Java development language to Intel's Merced technology and expand its jump-start advantage program to include key Java Internet developers such as Ariba Technologies (developers of operating resource-

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Nimantics Disappears Into Thin Air

OWNER ACCUSED OF **FRAUD AND DECEPTION**

In early January, *boot* began receiving phone calls and e-mails regarding the apparent disappearance of Nimantics, a mail-order notebook company based in Tustin, CA. We were familiar with the company, having reviewed a few of its products in prior issues of *boot* and visited with the company at Comdex in Las Vegas. We were surprised to learn of its demise. But after a simple Usenet query returned hundreds of messages from disgruntled customers detailing their frustrations and annoyances in dealing with the company, we naturally attributed its disappearance to a traditional Chapter 11.

A sad tale for sure, but bankruptcies are a common occurrence these days. However, upon digging deeper, *boot* has learned that this may not be a simple case of a company shutting down operations, but instead, a bizarre situation involving possible premeditated fraud, embezzlement, and misleading business practices.

Since Nimantics was originally founded in Irvine, CA, and then later relocated to Tustin, CA, we contacted the respective city halls to determine whether Nimantics was ever issued a valid business license. According to the City Licensing Department in Irvine (a license isn't required in the city of Tustin), a license was issued to Nimantics in August 1995 and registered to Nimesh Desai, the apparent owner. *boot* had never actually dealt with Desai—our point of contact had always been Nick Ray, Nimantics' sales manager—so you can imagine our surprise when we were informed by the Irvine police department that Desai and Ray were actually one and the same! It appears that Desai—or Ray, as we knew him—used an assortment of aliases that also included the names Chuck Jones and Chuck Smith. Since Nimantics had not contacted Irvine City Hall to file a notification of bankruptcy, the original license issued in 1995 is still valid.

"I sent a laptop back for a refund of **$2,300** and have received **nothing**," says a customer.

We then contacted the Better Business Bureau to request a company rating. According to William Mitchell, the president of the agency's Irvine office, Nimantics was rated as having an "unsatisfactory business performance record." Mitchell informed us his agency had compiled a report based on hundreds of complaints—a lengthy rap sheet. Although the specifics of each complaint are not made public, *boot* learned the list included allegations of the sale of defective merchandise; a failure to issue refunds on returned merchandise; a failure to honor warranties; and a failure to return merchandise sent in for warranty repair or exchange. We also discovered that whenever the BBB intervened on a customer's behalf, Nimantics would indicate it had taken care of the problem, when in fact, it had not. "The company had responded to some complaints by indicating an adjustment had been made, but customers generally disputed the response," said Mitchell. "In many other cases, the company [Nimantics] did not respond at all."

After discovering he was living with his parents in Tustin, *boot* attempted to contact Nimesh Desai—a.k.a. Nick Ray—for this story, but when we called the phone number registered to him, he refused comment, claiming his name was "Joe" and he was just "house-sitting." However, a former employee of Nimantics, no doubt impassioned by the anguished pleas echoing in the Usenet newsgroups, posted a reply detailing the company's sudden collapse. *boot* has verified the validity of the posting and has agreed to keep the identity of the employee confidential to avoid any possible retaliation.

"To all former Nimantics customers," read the posting, "Nimesh Desai ... and co-owner April Smith closed Nimantics on December 11, 1997. The employees were informed it was a business decision and to clean out their desks and leave." The employee told *boot* that each employee was given a hand-written check and told to get out (surprisingly, the checks didn't bounce). However, before they left, some employees inquired about the status of the systems waiting to be serviced (approximately 50 in total) and offered to ship them back to the customers. They were told not to worry about them, and those 50 systems have since disappeared.

"I sent a laptop back for a refund of $2,300 and have received nothing," said Dean Savalli, a former customer. "My credit-card company says I waited too long to dispute the bill, and now I have to pay for a product I don't have."

So should you avoid using a mail-order company altogether? Probably not, but there are a few things you can do to protect your investment. For one, contact the Better Business Bureau in the vendor's area. Although it won't officially endorse or recommend a product or company, it will provide a report detailing the company's history, free of charge. Second, forget about using the vendor for any repair or warranty work.

"If you elect to ship your system back to the vendor, once it leaves your hands, it's pretty much out of your control," said Mitchell. "If it breaks down, even if it's under warranty, use a local repair company."

Mitchell also stresses that under no circumstances should you purchase anything from a company that claims it is no longer accepting credit card payments. "Companies such as Visa or MasterCard will revoke their services if too many charges are disputed," he said. "If the company won't accept your credit card, then take your business elsewhere."

And what to do if you are taken for a ride? Contact the Office of the Attorney General in the state where the company is doing business. If it gets enough complaints, it could launch an investigation resulting in possible prosecution. Second, make sure you register a complaint with the Better Business Bureau. Filing a report with the local police department and even the FBI is also a good idea; however, the FBI will only launch an investigation if the fraud amount is over $50,000.

At press time, *boot* has learned that Desai is once again using the name Nick Ray and has opened up a business named AS&D in Tustin, CA. We called AS&D, but were unable to speak to anyone named Nick, Nemish, or Chuck. We did however, reach a receptionist who warned us, "you don't want to buy anything from these guys ... the FBI and police are after them."

And soon, the U.S. Postal Service may be too. Since Nimantics may have committed mail fraud, the U.S.P.S. has federal jurisdiction in bringing additional charges against Nimantics and Desai. Postal authorities have been notified and are launching an investigation of the matter.

Check out the bootNet web site for additional information regarding this investigation. b

NI
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TOMORROW AND BEYOND
?

NUGGETS

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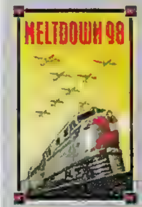
management applications) and Web Logic (maker of the Tengah Java application server).

HP is establishing a Java/Merced porting and testing facility and will provide developers with planning, technical support, and tool sets to transition their programs to the Merced platform.

Merced, which will allow the same CPU to process Windows- and Unix-based applications, isn't expected until sometime in 1999.

Microsoft Meltdown '98

Microsoft officially announced the feature set of DirectX 6 and previewed it for the first time in early February with developers at Meltdown '98. The show, which gathered together over 900 developers representing more than 100 software companies and 50 hardware companies for a week in Bellevue, WA, to test their software and hardware with the newest APIs on both Windows NT 5 and Windows 98. The first two days are composed of conferences that showcase DirectX, explaining each of the components in detail with the last three days set aside for compatibility testing and performance tuning of code and hardware.



Microsoft outlined a roadmap for DirectX development with both Windows NT and Windows 95, but wouldn't commit to any specific release dates. And hoping to avoid the mistakes that plagued DirectX 5—such as poor developer communication, a lack of implementation of advanced features, last-minute additions, and poor-quality driver implementation—Microsoft has taken a cue from id Software by declaring "the drivers will be released only when they are ready." And that, according to DirectX Product Manager Kevin Bacchus is "when developers say they are." By laying the groundwork early to provide and exchange information with developers, Microsoft hopes to gauge the readiness of the drivers based on their feedback. It was hinted, though, that the first beta of DirectX 6 may be released in early May to coincide with the Computer Game Developer's Conference.

DirectX 6 will be fully implemented in both Windows NT 5 and Windows 98 (although the new OS will be initially released with DirectX 5) as well as Windows 95. In addition, Microsoft continually stressed that Windows NT 5.0 will be the development platform of choice for both software and hardware developers, and announced that Windows 98 will be the final release of the Windows 9X operating system and that NT 6 will make the move to the consumer base.

Key new features of DirectX 6 include:

- faster performance with additional features in the Direct3D API that include single-pass multi-texturing, bump mapping, vertex buffers, stencil planes, and texture compression
- greater stability, reliability, and scalability across all of the APIs
- the DirectMusic API, which will allow developers to sync redbook audio to games, play MIDI that

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interacts dynamically, and add support for customized instruments with unlimited total instruments (currently limited to 128)
- complete integration into Windows NT 5
- advanced DVD support via the DirectShow API

For more on DirectX 6, check out our preview on page 60.

Digital, IBM To Break 1000MHz Speed Barrier by the Year 2000

The new generation of...
high powered
Alpha
architec

That 500MHz Slot 2 Deschutes or Merced processor won't be the reigning speed king for long, at least according to IBM and Digital Equipment, who both plan to introduce a 1000MHz microprocessor by the year 2000.

DEC's third-gen 21264 family Alpha will reach 1000MHz in two years, probably maintaining its performance edge over Intel's forthcoming Merced chip.

The 15.2 million transistor chip is fabricated using a 0.35-micron, and features a 2.0-volt core. In the next few years, the chips will be fabricated using 0.25-micron and 0.18-micron process technology.

Other features of the new microprocessor family include out-of-order instruction execution, 64K on-chip data and instruction caches, improved branch prediction through intuitive execution, and increased bandwidth for high-speed access to Level 2 cache and system memory.

Following the announcement that Digital would be acquired by Compaq, many have speculated the new owner would either give the Alpha family a new lease on life by throwing its support behind the microprocessors and using them in high-end servers, or would phase out Alpha production and turn to Intel's forthcoming IA-64-bit Merced chip.

The first member of the Alpha 21264 family is scheduled to ship in systems by mid-1998; the chips are now sampling and will enter volume production the first half of this year, according to Digital. Like the current Alpha microprocessors, the Alpha 21264 family will run Digital Unix, OpenVMS, and Windows NT operating systems.

IBM meanwhile, has come forward with a working prototype of an experimental CMOS processor running at 1000MHz.

Its PowerPC-platform chip is based on the company's 0.25-micron aluminum fab, but should shift to IBM's recently announced 0.18-micron copper process for a projected 25% to 30% improvement before shipping sometime around the year 2000 as well.

Egghead Closes Down The Coop

Egghead has announced it will be closing all 80 of its retail stores, affecting more than 800 employees, in order to shift its focus to an Internet-only sales structure.

The company had recently seen its third-quarter retail sales drop almost 13% to $99.1M, but its decision to abandon the retail market was no doubt influenced by the fact its Internet-only sales rose almost 500% to $11.8M. Said George Orban, Egghead's chairman and chief executive, "The amount of business that's being transacted over the net… is growing far in excess of retail growth."

The company will also change its operating name from Egghead Inc. to Egghead.com. b

Bonded Modems Deliver **High-Speed** Access

HITTING **SPEED/COST** SWEET SPOTS

Frustrated with lackluster 56K connections? Don't want to pay the high price for ISDN? Tired of waiting for cable modems? Doubling your connection speed really requires only two modems, two phone lines, and a little something called MPPP.

MPPP, or Multilink Point-to-Point Protocol, was originally developed in 1994 to bind multiple ISDN channels into higher-speed Internet pipes, but it works just as well with analog modem channels. Windows NT 4 has supported MPPP for years, and the new Windows 95 Dial-Up Networking 1.2 client released last November added support for two bonded analog or ISDN channels. But there's a catch: your ISP must support MPPP (luckily most do), and unless your ISP allows multiple logins by the same user ID, you'll also need to purchase a second user account. You don't need a special modem or even modems of the same brand. Heck, MPPP will even bond modems of different speeds.

As a result, modem manufacturers have begun rolling out nice, but nonessential, "two modems in a box" products. Forget the hardware—the main difference is the MPPP software.

Diamond Multimedia's Shotgun is an alternative to DUN 1.2 that supports an extension of MPPP called Bandwidth-On-Demand. Shotgun doesn't connect the second modem until it's needed, and disconnects it when bandwidth demand drops (such a feature will save money if your ISP charges by the minute). Even better, if you have call waiting on one line, Shotgun gives you an on-screen alert and the option to accept the call.

It's been widely reported that Shotgun works only with ISPs that use equipment made by Ascend Communications. Not so, according to product-line manager Jeff Orr. "All you lose when calling a non-Ascend switch is Bandwidth-On-Demand," he says. "And in this age of flat-rate Internet service, most people don't need it."

Shotgun will be distributed only with Diamond's SupraXpress 56 modems, including the forthcoming $200 Suprasonic II two-in-one model. However, other brands and speeds can be bonded to a SupraXpress with Shotgun.

Alternately, Boca Research's DynamicDuo combines two K56flex modem chips on one ISA card. Midcore Software's MidPoint client bonds the two data channels with standard MPPP and also lets up to five LAN users share the doubled bandwidth. Midpoint detects call-waiting signals and disconnects one modem to let voice calls ring through. However, it lacks Bandwidth-On-Demand.

Transend Corp.'s Transend 67 is a system more suited for corporate remote-access applications than consumer ISPs. The $599 dual-chip modem uses hardware-based proprietary technology to bond two 33.6Kbps channels, but the central-site server must run the same modems.

Another solution, Interex's $50 Web Overdrive software combines the bandwidth of two modems without MPPP. It speeds web surfing by downloading graphic files and other page elements in parallel, but each file moves at single-line speed. In other words, those naughty files you're downloading won't arrive any faster.

As expected, large ISPs have been slow to accommodate bonded modems, due to the logistics of updating their firmware and billing systems. NetCom, Mindspring, and Concentric Network are actively testing bonding technologies and developing price plans, but AOL, AT&T, and the Microsoft Network have no immediate plans for dual-modem service.

—David Hakala

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ATI is setting the new standard in 2D and 3D performance. Now ATI is even faster with the latest ATI RAGE PRO drivers. Check out our website at **www.atitech.com/boot** for information about ATI's most recent awards.

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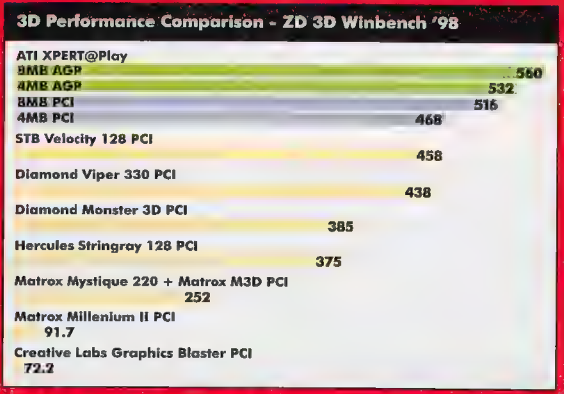
XPERT@Play
ATI-TV
NEW



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Product Information Number 85

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Kodak Professional DCS 520 Digital Camera *If you've outgrown the big-glass TTL action of the Olympus D-600L, it's time to consider some pro-caliber digital camera action. Designed with photojournalists working in the field in mind, the $15,000 Kodak DCS 520 is one serious camera. Beyond the burly 1728x1168 pixel CCD (which spews detail-rich 6MB files) and the 36-bit color depth (for image detail so rich you can retire on it), this year's model is based on a rugged Canon EOS SLR camera body, compatible with the full line of interchangeable auto-focus lenses and capable of surviving conditions ranging from 17 to 95 degrees Fahrenheit. And forget those interminable wait times during image write. The DCS 520 will grab up to 3.5 frames every second onto a 340MB PC card hard drive that can be tossed into any PC card slot for drag-and-drop image transfer. Or you can blaze your pix 'cross the built-in IEEE 1394 high-speed serial interface. And with details like a variable ISO of 200 to 1600, calibrated TTL flash, and histogram controls on the camera's built-in color LCD that'll render Photoshop obsolete, this is the digital camera you want.*

Eastman Kodak; 800.235.6325; www.kodak.com

Logitech Trackman Marble FX

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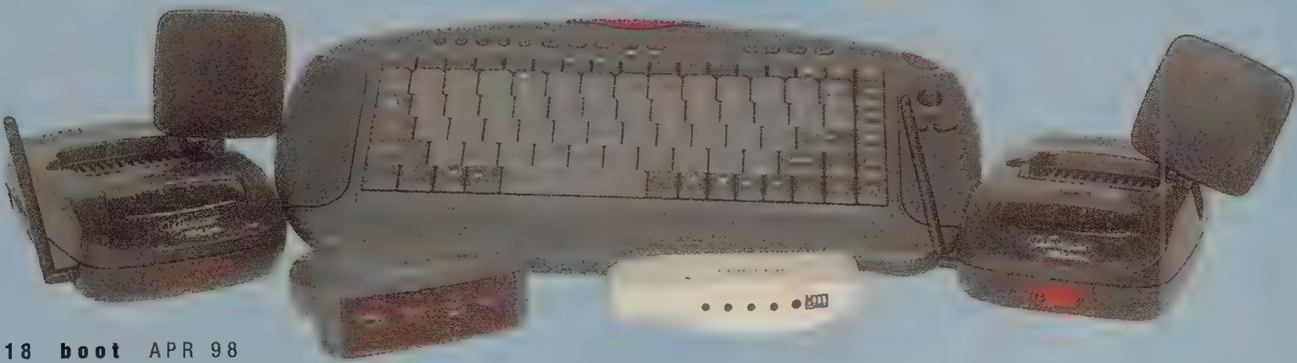
RF-Link; 310.787.2328; www.rflinktech.com



PURE LUST

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Between our web goth's ominous industrial screeching and our news editor's bizarre Canadian folk music, headphones are a must in the boot offices. But who wants a cord tethering his head to the PC's CD-ROM drive? Check these wireless headphones. Just park the IR transmitter on a perch for maximum range and roam up to 25 feet with digital quality sound. Twin IR sensors on both sides keep you tuned in as long as you're in the line of sight of the transmitter. And an auto-mute circuit saves you from annoying static when you wander too far away from home base. Priced at $50, these comfortable, retro-styled headphones work.
Laral Group; 888.293.3332; www.laral.com/

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Qualcomm; 800.349.4188; www.qualcomm.com

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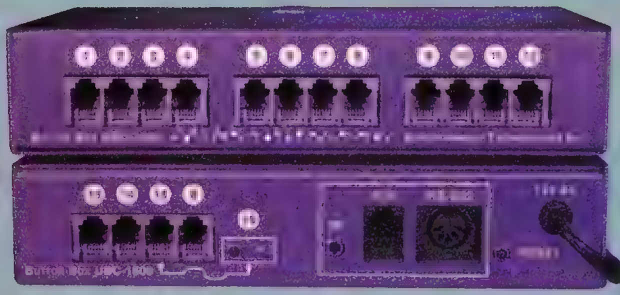

The Button Box UBC-1600

When we first laid eyes on the Button Box we were impressed. It looked mighty cool, but darn it, none of the bootBoyz or Girlz could figure out what the heck it was supposed to do. Well guess what? It's a Button Box—and it controls things. DUH! Put simply, the $749 Button Box can be the master of your domain. It's fully programmable and provides a powerful interface that allows you to easily direct and coordinate a staggering array of electronic devices from the comfort of a center seat. DVD? Check. Sony monitor? You betcha! Proximity Detector? Oh yeah! Airport telephone dialers? Yes! Theme-park shows and rides? Why not! The unit can be programmed to handle just about any device (application software that can be modified and downloaded into the unit is included), and you can even arrange a specific sequence of events to occur when a certain button is pressed. Very kewl. Oh yeah, the buttons aren't included.
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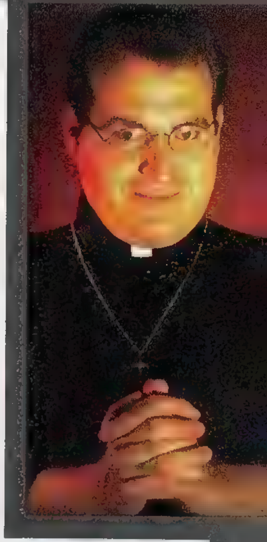
WITH ALEX ST. JOHN



ALEX ST. JOHN From his position as Microsoft's game technology evangelist, Alex St. John was responsible for the controversial DirectX APIs that have either taken PC gaming to the next level or were horribly broken, depending on your point of view.

The Microsoft **Anarchists'** Cookbook

TOPPLING THE **EVIL EMPIRE** IS WITHIN YOUR **GRASP**...IF YOU KNOW THE **SECRETS**

I'd like to address all the Microsoft haters out there who think Microsoft's power is a bad thing, but don't know what to do about it.

The first thing an effective Microsoft Anarchist needs to learn is what actually makes Microsoft strong and what makes it weak. You'll have to give up some firmly held and cherished delusions about what makes the Empire work.

Delusion #1: Microsoft ruthlessly crushes competitors with a host of unfair business strategies, including shutting them out of the market, deliberately breaking support for their products, swamping a problem with resources, and so forth.

Actually, this perception often defeats a competitor long before Bill gets his hands on it. In my years at Microsoft, most "competitive threats" Microsoft mobilized against were dead long before Microsoft laid a glove on them. Usually a handful of people waving Microsoft business cards and shouting "BOO!" were enough to send a competitor spiraling into oblivion.

Delusion #2: Microsoft is a behemoth that marches along consuming and destroying everything it encounters.

The truth is that Microsoft is rarely effective at displacing a good competitor. Adobe, EA, and Intuit all thrived despite Microsoft's most aggressive efforts. The people who make great technologies are rarely the same people who know how to handle real competition when it comes. The minute they perceive a threat, they change what was originally a focused formula to cope with some perceived threat that often never arrives. The simple act of changing a working thing is usually enough to destroy it. SGI, Borland, Novell, and Lotus had a winning edge but blew it by hallucinating. The only spit left in Bill's eye from Apple is QuickTime.

> If you think you're helping to **beat Microsoft** by supporting **Java**, buying a **network** computer, or using a **Netscape** browser, you're mistaken. You're just buying seats for Microsoft's show.

Microsoft is only effective in two key markets: operating systems and office software. Everything else is acquired, losing money, or running second at best. I've never seen Microsoft beat a competitor that stayed focused. Companies with cool heads can take turf from Microsoft.

Delusion #3: Microsoft wants no competition.

Competition is the fuel that feeds Bill's fire. Without a major competitor, Microsoft loses its own focus and slows to a crawl. Contrary to popular perception, Sun's, Oracle's, and Netscape's ongoing duels with Microsoft are actually good for all companies involved. While the battle is high-profile, everybody's stock soars and nobody has to burn a lot of cash buying advertising. It's like a prize fight, where even the loser takes home a few million dollars. Unix workstations, databases, and proprietary commerce servers aren't exciting news to the masses who buy products and stock. Java, network computers, and browser wars draw an audience. Publicly kicking Bill in the nuts is a very profitable. If you think you're helping to beat Microsoft by supporting Java, buying a network computer, or using a Netscape browser, you're mistaken. You're just buying seats for Microsoft's show.

Delusion #4: There's very little an individual can do about it. This is a job for a big company or the government to fix.

Rarely has another major company or the government destroyed a monopoly. The usual causes are major economic movements, innovations, or loss of leadership. Nobody will take away Microsoft's business. Somebody—some individual or small group of people will have an idea that redefines computing in such a way that Microsoft remains big, yet becomes irrelevant. IBM is still the largest software company in the world, it still has five to six times as many employees as Microsoft, and it still controls a vast empire. Yet somewhere along the way it lost its "monopoly" status because something changed in computing, and IBM missed it.

There are places big companies just can't go. Contemplate this:

Bill wants to make a media empire, and yet some of the most important aspects of media involve sex and violence, two businesses Microsoft dares not touch lest they jeopardize its cash flow.

Microsoft can't innovate; it must buy its best new ideas. Compression technologies, 3D engines, set-top boxes, SoftImage, Altimira Composer, PowerPoint, Money, and of course all Microsoft games are developed externally. Despite the perception, Microsoft R&D's greatest contribution is the smarmy paperclip in Word.

Microsoft moves like a barge. Most competitors blow it when they think Microsoft is going to eat them for lunch and lose focus. The most serious competitors were often small products Microsoft didn't even notice until too late and then was forced to buy a solution.

Oh yes, consumers. As PCs proliferate, the demand for them to become more reliable and easier to use will grow dramatically. This need conflicts directly with Microsoft's need to make ever bigger, more complex OSes and office products to justify prices and upgrade fees. And consider Microsoft's ignorance about who an average consumer is and what he needs. People more in touch with the real world will make products that serve normal people better, without complexity. When that happens, just as happened with IBM, Microsoft will not collapse but merely cease to be relevant. These ideas won't come from Sun, Netscape, or Oracle, who are just as clueless about simplicity as Bill is.

They will come from you. b

IN THE FUTURE, MACHINES WILL NOT BE USER-FRIENDLY.
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SHADOW MASTER

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THE SCOOP FROM A MAJOR PLAYER

GAME THEORY

WITH T. LIAM McDONALD

The **Fall** of **PC Gaming**, Volume I

THE **LAWS OF EVOLUTION** AFFECT **COMPUTER ENTERTAINMENT**

Nine-tenths of everything is crap.

This maxim, coined by author Theodore Sturgeon, applies to everything: literature, movies, politicians, doctors, game reviewers, and so on. So it follows that in any business, computer gaming for instance, one product out of every ten is good, and the rest barely toe the line. Thus, the fact that there never seems to be a wealth of worthwhile games is understandable and logical.

Think about the titles that *truly* stood out last year. Of the 3,111 entertainment titles published in 1997 (according to PC Data), were there 300 *really* good ones? Not even close. We'd be lucky if that number were thirty. That's 1%, not 10%.

The question that should smack you over the head right about now is: *What about the other 3,081?* Last year publishers spent money (*lots* of money), time, and effort to develop 3,081 titles ranging from mediocre to garbage. This landfill consumed thousands of man-hours of labor, precious natural resources (fossil fuels, trees, water, Twinkies), the hard-earned dollars of consumers, and a large amount of investment capital.

So why don't they just make 30 good games instead of dumping the 3,081 bad ones on us? Following Sturgeon's Law, if publishers released 30 games, we'd only have three good ones. And if we use their actual performance as a gauge, we wouldn't even see one complete game worth a damn.

> The nature of **creative industries** and the diversity of **consumer tastes** (or lack thereof) mean **some sucker** will pay to see *Police Academy VX*, or to play *Streets of SimCity.*

Here's where Sturgeon's Law runs smack into the wall of natural selection, which states that species will struggle for finite resources to survive, and species must adapt and develop variations that they in turn pass on to their progeny. The species that adapt survive, while the others enter an evolutionary cul-de-sac and vanish.

One might assume from this that those 3,081 games should just go away. The good news is, many of them will. The bad news is, it takes a lot of time.

The entire entertainment industry thrives on Sturgeon's Law. In most other businesses, companies creating inferior products would be slaughtered. However, the nature of creative industries and the diversity of consumer tastes (or lack thereof) mean some sucker will pay to see *Police Academy XV*, or to play *Streets of SimCity*. If the entertainment business was in the wild, it would have been lapped on the evolutionary track by the tree sloth. This means that somehow, somewhere, as long as there are PCs, there will be an *Island Peril*, an *Assassin 2015*, and a *Soldier Boyz*.

This simple theoretical inevitability still doesn't answer the single burning question that drives anyone who surveys computer games: *Why do people continue to make bad games?*

The various answers to this question could be used to reform the game-development process. That is, if we had answers. Regardless of the game's genre, the fundamental problem facing every nascent game developer is the same: rapidly evolving technology has not caught up to the methods of production. We're still learning how to use all the new tools being created every day, and future tools must be counted into the equation. The goal post is constantly moving farther downfield. Poor initial planning and limited vision leave programmers chasing a moving target, which they can never catch, unless they learn to anticipate and prepare for it.

T. LIAM MCDONALD is the all-knowing god of gaming. His mother still can't believe that he plays games for a living.

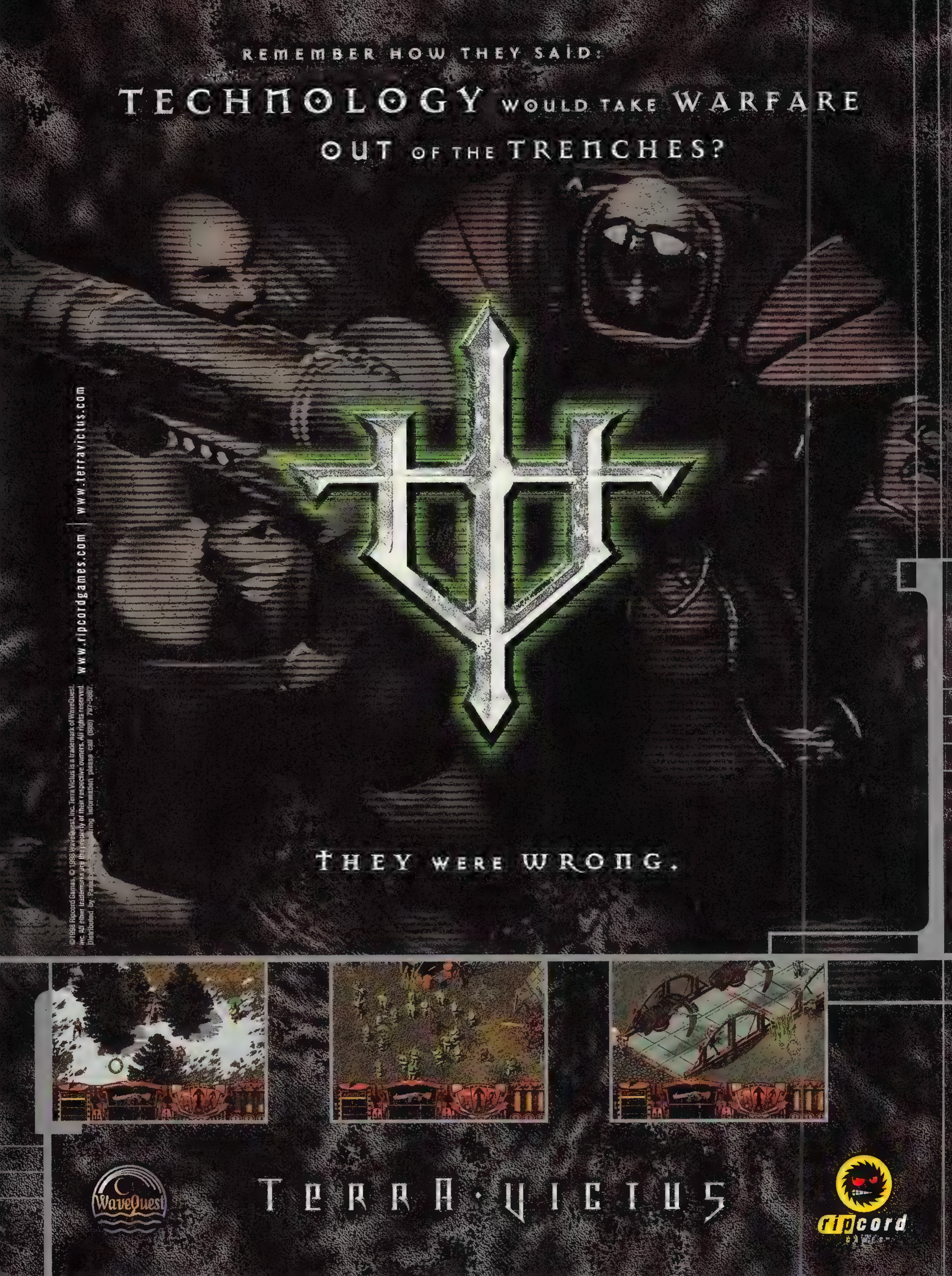
Designer William Volk explores some of these points in an article called "Why Can't Johnny Ship?" for the online developer 'zine *Gamasutra* (**www.gamasutra.com**). In it, he makes a pertinent analogy. When Boeing was developing and building the 777, they didn't keep changing the design as they went along to allow for new technology. They did all the planning ahead of time, locked down the design, and then made the plane.

The space shuttle is another example: much of the technology is essentially vintage 1970s. Your desktop PC has more power than many of the systems on the shuttle.

NASA realized (in some areas a little too late) that chasing technology was a race that would inevitably be lost, so they planned for it and around it.

In my next column, I'm going to look at the core issues that drive the quality of games down and result in buggy, unstable, technically inferior, badly running, and just plan un-entertaining games. As an example, I'll look at four games released last year that got pretty much everything right (*Seven Kingdoms*, *Curse of Monkey Island*, *Jedi Knight*, and *Longbow II*) and four creative failures (*Conquest Earth*, *Blade Runner*, *Descent to Undermountain*, and *Red Baron II*).

Maybe then we'll be able to answer the cousin to Volk's question, "Why, when Johnny finally does ship, is his product so bad?" b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Java: Too Legit to Quit

SCOTT MCNEALY'S **GOLDEN CHILD** COMES OF AGE... DESIPTE HIS EFFORTS

What Sun's CEO Scott McNealy doesn't get is that he's already "got it" and should shut up, for once. Like the kid with the best bike on the block, he needs to be known for his prized possession. So, invariably, someone comes up with something better . . .

But McNealy's bike wasn't always so shiny.

Early Java apps sucked, although that wasn't entirely the fault of the Java development team at Sun. It was more about ineffective programming (see *boot* 04) than weak design methodology, as so many critics shouted. Few programmers understood the architecture's paradigm shifts. This ultimately rendered those ancestral apps bulky and slow.

This also collided with unforeseen browser features that went on to manifest scads of security issues, such as cookies that leak privacy and produce financial-transaction hell. But who could've anticipated these "features," let alone the standards path of browser-to-server-to-database interactions back in the early 90s, when Java was in the test tube?

Still, Sun should fess up to a few problems. Changes in Java between versions 1.0 and 1.1 wreaked scores of backward-compatibility issues. And a technology that allegedly runs across any platform still blows chunks on any 16-bit operating system—which represents almost a third of the machines on desktops today.

> Despite some early glitches, **Java** persisted, partly because the Java concept birthed a **brilliant marketing strategy**, the first and only successful marketing strategy **Sun** ever accomplished.

Despite these early glitches, Java persisted. Maybe it was because the Java concept birthed a brilliant marketing strategy, the first and only successful marketing strategy Sun ever accomplished. Maybe it was because Microsoft-domination fears swelled to unexpected proportions and developers clambered desperately for any alternative solution.

But could it be that Java actually had/has the potential to reinvent software not only because it is a capable programming language, but because it's actually a good one. Yes, Java is a good language. And it proves this everyday, as it leaves behind those little web games and animations to tackle hardcore enterprise markets.

The road to enterprise has not been easy, partly because the enterprise market must be more than conservative—it needs to be dead sure. Wall Street, the jury on such multibillion-dollar matters, has had a field day ridiculing Java's inadequacies (though it's difficult to say there's been even one thorough, let alone conclusive, investigation into the technology). More importantly, the establishment has gone wild ridiculing Scott McNealy and his outlandish I-am-king manifestos, bumbling Bill Gates jokes, and in general dislikable personality.

Despite its reputation and McNealy's daily blunders, a slew of recent announcements suggest Java is ready to come out of the closet, proud and strong.

IBM and Lotus have teamed on the Lotus eSuite WorkPlace, the first complete Java-based productivity solution with access to e-mail, the web, and a set of compact biz apps. Desktop equals enterprise.

Versant Object Technology (specializing in object database software used to model complex systems and processes) announced new tools and partners intended to integrate Java client apps with its database software. Database equals enterprise.

Extensity, a fresh start-up, will launch the first "100% Pure Java" application to automate corporate travel-expense reporting. Those with expense accounts know this is a big part of daily corporate operations. Operations equals enterprise.

DCC Technology Management Group (offspring of $7.7 billion manufacturing corporation, Dana) will release a Java version of its *Wyzdom* asset-management program. Asset-management equals enterprise.

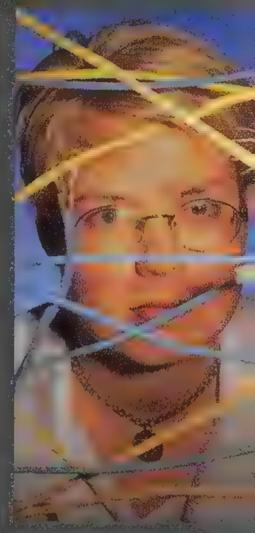
Oracle announced it will recast its client/server enterprise resource-planning applications in Java, which include financial, human resources, distribution, manufacturing, and sales modules. Oracle equals enterprise.

And tech companies aren't the only ones hot for Java. Ralston Purina completed a Java-based manufacturing application this year. Multibillion-dollar Home Depot is using Java for inventory tracking and human-resource management, and as a virtual office for off-site managers. Sabre Technology (the online travel and flight scheduling and purchasing baron) also plans to port its *Qik-Access* software to Java; its goal is to make the move to a "thin client" networked computer system. And this is just the beginning of an increasingly long list.

Successful companies such as Lotus, Ralston Purina, and Home Depot don't toy with new technologies and standards issues because of cleverly hyped marketing strategies or bandwagon ballyhoo. And they certainly don't spend billions on techno-philosophical re-orgs because they're threatened by Microsoft domination, (despite Mr. Gates's outspoken fears of just this).

Clearly these are issues of customer demands and increasing dependency on the Internet and the technologies that work well with the Internet—technologies such as Java.

But the fumbles that could cost the game are McNealy's endless tirades against Bill Gates and Sun's Microsoft-esque quest to control Java (with the 100% Pure Java initiative). If Sun could just realize it has the shiniest bike on the block and focus its energy on keeping its prized property polished, there isn't a lot anyone else can do to stop the momentum.



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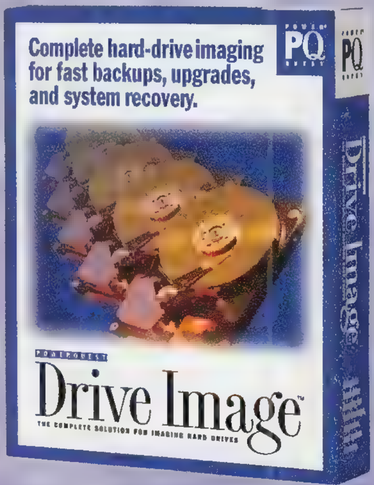
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Product Information Number 281

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INTEL'S **IA-64** PROMISES TO **REDEFINE THE CPU** AS WE KNOW IT

TOM HALFHILL is a senior editor at *Byte* magazine and the author of two computing books. He first became interested in computers during the disco era.

Intel and Hewlett-Packard unveiled their IA-64 chip architecture last fall, and I expected a flood of mainstream press coverage. Why not? After years of wallowing in near obscurity, the computer industry has become the darling of the mass media. Arcane stories about CPU bugs and operating-system wars are now routine fodder for daily newspapers and TV talk shows.

But for the most part, the mainstream media missed the IA-64 story. (Even stranger, so did many computer magazines.) Then I realized why: Harried journalists have trouble focusing on something that's still two years away. Also, the initial information about IA-64 was so technical that most people didn't know what to make of it.

Yet another factor is that Intel and HP are keeping crucial details about their next-generation architecture under wraps. Never have I seen such high walls of secrecy around a new project.

Why are they so paranoid? Perhaps they realize better than anybody else how much is riding on IA-64. It's not just a Pentium III or Pentium IV. It's not an instruction-set extension like MMX. It's not even a linear evolutionary step like the 386's transition from 16 bits to 32 bits.

Nope, IA-64 is a whole new architecture. It will have provisions for backward compatibility with x86 software, but the 64-bit core of the CPU will trash the x86's 20-year-old baggage. Although it doesn't introduce any startling new technologies that haven't been tried before, no other processor unites all of IA-64's technologies in a single architecture. IA-64 will require new 64-bit operating systems, new optimized compilers, and new application software.

IA-64 will require new **64-bit operating systems**, new optimized compilers, and new application software. In other words, it's a **major gamble**.

In other words, it's a major gamble.

When the mainstream media get around to digesting this story in 1999, chances are they'll focus on the 64-bit angle. Hey, aren't twice as many bits twice as good? That's what Nintendo and Sega said when they moved from 8-bit to 16-bit to 32-bit to 64-bit consoles. But the 64-bit aspect of IA-64 isn't the central story. Intel could have stretched the 32-bit x86 to 64 bits without changing the architecture as radically as IA-64 does. Besides, there's nothing new about 64-bit processors. They've been around for years—you can buy them from Digital, IBM, Sun, SGI/Mips, and just about everyone else. Heck, you can nab a 64-bit game console for $150 at Toys 'R' Us.

No, the big news about IA-64 is how it looks forward to an era when a single chip will contain hundreds of millions of transistors, not just a few million transistors like today. The vast transistor budgets of the early 21st century will pose a challenge to CPU architects: Can they use those resources to build highly parallel processors? Or will they merely resort to dumping the transistors into larger on-chip caches?

Not that there's anything wrong with large on-chip caches. By temporarily storing more data close to the core, caches help keep fast CPUs from outrunning the computer's slower memory. Ideally, though, engineers would spend those transistors designing better logic circuits that execute more instructions per clock cycle. A large cache is like a bank account that stores your money where you can get it; better logic is like a raise that pays you more money in the first place.

Modern CPUs boost their processing power with parallel pipelines that execute multiple instructions at the same time. Unfortunately, CPUs are hitting a wall with this superscalar approach. Most of the recent performance gains are coming from higher clock speeds, not more pipelines.

For example, the new Deschutes-series Pentium II chips will eventually deliver at least 50% more performance than the Klamath-series Pentium II. But that's only because they run at higher frequencies—both types of chips have three integer pipelines. Adding a fourth pipeline should theoretically boost performance by 33%, but it actually wouldn't. The Pentium II already has trouble keeping three pipelines busy.

Today's widest superscalar CPUs can process only four or five instructions at once. Wider designs are possible, but the payoff isn't there. The additional pipelines would be idle most of the time because the rest of the system (particularly RAM) can't keep them fed with instructions and data. So engineers are spending their growing transistor budgets on larger caches, which help keep the pipes flowing and are easier to design. What they really want to do, though, is add more pipelines.

IA-64 tries to attack this problem head-on. First, it redefines the instruction format to pack multiple instructions into a single bundle. Second, it requires the compiler to put those instructions in the most efficient order while the program is being written, rather than expecting the CPU to do it while the program is running. Third, when a program reaches a branch, the CPU can execute instructions for both possible outcomes before the user even decides which way to go; then discards the results for the path not chosen. Fourth, the CPU can load data from memory well before the program needs it and even prevent crashes if the data isn't valid.

Clean breaks are never easy, and they're often prone to failure. IA-64 is a true break with the past. Intel is taking a bigger step than most people realize. ▮

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the boot interview

Minister of Arma

PHOTOGRAPHY BY MARK MADEO

ments

It's been almost two years since the great 3D war broke out, and casualties abound. But nVidia's Minister of Armaments **David Kirk** isn't worried. He has complete faith in his troops. He claims they're faster and more powerful than the enemy. And he claims they outnumber the opposition by at least a million. It's obvious Kirk likes his job, which he describes as "making sure we kick the snot out of all the competition."

Fire away!

"I expect our fill rate with Riva4 >

"I believe boot's been a little harsh, but clearly there are noticeable dithering artifacts with the **Riva 128**. Every graphics chip has some weaknesses. The essence of providing a good product is making trade-offs."

boot ***Let's get straight to it. Is it true the Riva 128 often uses a low-res mip level from the card's local memory, leaving the "correct" one sitting in main memory?***

Kirk No, because the mip-map level that's used per polygon is calculated and the result of that calculation is the level used—and it doesn't have any way of determining whether it's local or not. So it uses the one calculated to be correct.

Does a lower-res mip-map level sometimes get used? Yes. But how do you decide which is the right level? We try to make the best choice, but it has nothing to do with where the mip-map level is stored currently or whether it's in cache.

boot ***Should the generation of mip levels be left in the hands of software developers?***

Kirk Developers should have a choice. If they want to generate their own mip-map levels, they should do that. If they'd rather have us do it, that's a service we can provide.

boot ***But why doesn't the Riva include a utility to turn off the auto mip-mapping feature?***

Kirk Auto mip-mapping can be turned off. There's a nice freeware control panel that lets you tweak all our Registry settings.

boot ***Why not include this utility in your software driver?***

Kirk We provide it to the developers who ask, and we'll be providing it with our SDK the next time around. We don't actually produce a control panel because we sell through Diamond and STB, who provide their own control panels.

boot ***Is that utility something you recommended to Diamond or STB?***

Kirk Absolutely. And in fact, there are a lot of things besides the auto mip-mapping that people want to set, such as gamma.

boot ***Back to the point, does this low-res technique skew the Riva's benchmark results?***

Kirk Certainly, if you're moving to low-res mip-mapped levels you're pulling fewer textures across the system bus. And that has an effect. But it's not as big as the CPU dependence and it becomes smaller as you move toward 2x and 4x AGP.

boot ***Do you personally think boot's criticism of the Riva's visual quality was unduly harsh?***

Kirk Well . . . I believe you've been a little harsh, but clearly there are noticeable dithering artifacts with the Riva 128. But we're going to be releasing our first major software rev beyond the initial release. And as you know from your reviewing experiences, our OEMs have not updated their software release since the initial shipment. Through the course of a lot of application game testing, we've gone and fixed a lot of the bugs you noted and increased our D3D performance by about 50%.

boot ***So you acknowledge visual defects with the Riva 128?***

Kirk Absolutely. Every graphics chip has some weaknesses. The essence of providing a good product is making trade-offs.

boot ***What kind of trade-offs?***

Kirk We had to choose some approximations in order to make things fast. We simplified the texturing pipeline. We do not do per-pixel mip-mapping with the Riva 128, but we did run a bunch of tests of what I will call poor-quality per-pixel mip-mapping versus very careful propelling on mip-mapping with subdivision of the polygons, if the mip-map variation is too extreme. And we found many cases where per-pixel mip-mapping didn't make the picture look better; it just made it look different.

Look at a graphics vendor—and I won't mention any names—who does per-pixel mip-mapping, but doesn't do a good job of choosing which mip-map per pixel and doesn't blend smoothly from one mip-map to the next. In a game such as *Moto Racer*, you're moving from near to far and you see mip-map-level transitions. You see this line from one mip-map to another, and it's jagged and screwed-up because of the poor choice. If you look at the same game with the Riva 128, you don't see that problem because it's broken up—the transitions happen at the polygon boundaries, which are texture boundaries anyway. So you see a different texture with a different mip-map level. And that's a particular case where the per-polygon mip-mapping happens to look better.

< *will be in the ballpark of* ***two Voodoo 2s with SLI.***”

I'm not saying per-pixel mip-mapping is bad. I think if you're very careful, it can look much better than per-polygon mip-mapping, but I don't think we've seen many examples of that yet. You'll see that with our next product.

boot ***What other trade-offs have you made?***

Kirk We chose our precision very carefully to make sure we could hit our target polygon rates and fill rates: 100 megapixels per second.

“*It's to* ***Intel's advantage*** *to make the world very complicated in order to defend itself against other*

One problem is banding in some titles because we don't have infinite precision for all our shading calculations. That's not unique to the Riva 128. You see banding in other cards, but if we had forever to tune, we could have picked the exact number of bits to use for every calculation, so you wouldn't see it anywhere. But we had to make choices.

The biggest compromise we had to make was for time. We had to stop fooling with it and get it out.

boot ***Were the compromises worth it?***

Kirk They allowed us to finish the chip in time. We were able to ramp-up and supply Dell, Micron, and Gateway with a large number of chips this fall.

boot ***How does the visual quality of the current Riva chipset compare to the current Voodoo chipset?***

Kirk I think it has different visual quality. I believe the Voodoo was the best product of the year, but it has approximations as well. There are texture addressing problems that are covered up by excessive filtering, so Voodoo textures are quite blurry. But that's less annoying than being jagged.

boot ***What about Voodoo 2?***

Kirk I don't see any difference between the Voodoo and the Voodoo 2 except that Voodoo 2 is faster and does multiple textures. The biggest issue with the original Voodoo was performance. The Voodoo 2 addresses that, but at a higher cost, which really takes it out of the mainstream market.

With our second release of drivers, the Riva 128's performance is going to be in the ballpark of Voodoo 2, for $100 less, plus you get integrated 2D/3D. So 3Dfx just didn't really add anything compelling to Voodoo 2. It didn't improve the texturing quality, and that's its biggest weakness.

boot ***How difficult is it to integrate 2D?***

Kirk It's not rocket science, but you have to do it right. You have to pass all of the WHQL tests, you have to do VGA correctly. If you do it 99.99% correct, with just a few problems, that's the same as not doing it at all. And no PC vendor can sell your chip.

boot ***What one thing do people do wrong all the time?***

Kirk VGA is not a documented standard, but a legacy functionality. You have to reproduce the legacy VGA, bugs and all. And that's something people often have to learn by trial and error.

boot ***What is more important: a rich feature set or sheer speed?***

Kirk Features are important, but different features have different levels of importance. The most important thing for 3D gaming is performance because if you're not running at a reasonable frame rate, there is no game. Beyond that, you have to have fogging, you have to have perspective correct texture mapping, and you have to have good lighting and interpolation.

boot ***How do you define "high performance"?***

Kirk Over a million polygons per second texture mapping . . . everything turned on. Riva 128 peaks at five million polygons a second, but they're very small polygons. Clearly the CPU can't provide that kind of polygon throughput, but with higher processor speeds over the next year or two, Riva 128 will continue to scale-up. In 3D WinBench, our chip is typically idle more than half the time because you're testing how fast a CPU can do transformations and lighting and send us the vertex data. We'd like to see benchmarks run at higher resolutions because we have fill rate to burn. We probably won't bottleneck until 450MHz or 500MHz Pentium II.

boot ***So there's no danger of being processor-dependent?***

Kirk Processor dependence is a double-edged sword. Clearly it'd be better if we were able to offload more work from the processor. But the reverse of processor dependence is having headroom in the hardware. If the processor gets faster and you don't get any faster—that's not good.

boot ***Exactly what kind of scalability does the Riva have?***

Kirk We scale linearly with processor speed. So if you go from a 300MHz Pentium II to a 450MHz, we're roughly 50% faster. And it's a pretty constant scaling with resolution. By the time this is out, we'll have a second major release of software drivers that have substantial performance tuning and a lot of bug fixes. And with these new drivers, most games can switch from 640x480 to 800x600 and the frame rate doesn't change. We've done a lot of work to make sure there aren't synchronization problems between the graphics and the CPU.

boot ***What resolution would you like to see games run in 1998?***

Kirk It's time to move on from 640x480. Developers should assume people are going to play games at 800x600 and expect people who buy high-performance cards to play at 1024x768 or higher. I wouldn't go to 1280x1152 yet, but 800x600 or 1024x768 are both very reasonable resolutions to expect throughout 1998.

boot ***How do you feel about AGP? Has Intel done a good job with it?***

Kirk Intel's made a good start, but it has been reluctant to promote AGP too much until it's able to transition its AGP-capable bridge chips in volume. Intel made a mistake with the MMX transition by really hyping it before wrapping up production, and I think Intel's afraid of doing the same thing with AGP. You'll see a lot more talk about AGP from Intel going forward. Its big push is just about to begin.

boot ***Do you think it was a mistake for Intel to provide so many flavors of AGP?***

Kirk It's to Intel's advantage to make the world very complicated in order to defend itself against other CPU and bus interface chip vendors trying to compete.

If Intel could have jumped immediately to AGP 4s with DMA and execute mode, that would have been the best. I'd like to have had that last year. But Intel couldn't get there right away and chose an incremental approach.

boot ***In the big picture, how important is it for nVidia to get on motherboards?***

Kirk When you're integrated on the motherboard, your customer is locked down. They have to ship you for awhile. Your chips are soldered on their boards and they're stuck with the inventory.

boot ***That's an interesting choice of words—stuck.***

Kirk In these exciting times of 3D graphics moving very quickly, I don't think that's a good strategy for PC OEMs. Their best opportunity is to adopt the best new chip every six months. And our strategy is to introduce the best chip every six months.

boot ***So you're not going after the motherboard market?***

Kirk We're certainly interested in the motherboard market if our customers are interested in that sort of solution. We're currently on one of NEC's motherboards. But I'd say that fewer than 5% of the systems sold have graphics soldered on the motherboard, and I see that number getting even smaller.

boot ***But motherboard integration is the most economical way to do things.***

Kirk You have to look at a higher level of integration in the sub-$1,000 and sub-$500 PCs. But a better place to integrate might be how Cyrix is integrating graphics and the bus interface in the CPU. Those integrations provide a better value, but it's a low-end kind of thing.

boot ***Do you see any significant role for integrated audio and video media processors going forward?***

Kirk We like to learn from our mistakes and we often joke that NV1 was the first to demonstrate that the media processor is not a good idea. We made that mistake a long time ago . . . others are making it now.

3D requires a good amount of dedicated hardware. So a media processor is never going to be the fastest 3D engine. They're going to be coming out and saying, "Well we're not the cheapest and we're not the fastest . . . we're the most mediocre—so you should buy our product!" I just don't see a future in that.

boot ***Do you think AMD's K6+3D is that kind of dead-end product?***

Kirk It's going to be great, and the Riva 128 will be the fastest graphics to run with it. The K6+3D will take away the CPU bottleneck for us, by really accelerating the transform and lighting.

boot ***Does it bother you that the sub-$1,000 market has exploded and, in a lot of cases, supplanted high-end machines in retail?***

Kirk No, I think it's actually a very exciting opportunity. Moving forward, you'll see nVidia products that are targeted for that market.

boot ***Will this product be the current Riva 128 or a new product?***

Kirk We first built the NV3 as a performance product to ship with Intel's fastest processors and the high-end consumer machines. Over time, it cost less to make them, and we can consider shrinking from .35-micron to .25-micron geometry. When we get down to extremely low cost, we can begin to push into those kinds of markets.

boot ***In a world of $99 graphics boards, what makes Riva worth twice as much as, say, a Stealth 2?***

Kirk Our chip's not more expensive than the chip that goes into the Stealth 2. What's different is what consumers are willing to pay. People are willing to pay for the value they get. The number of games we support and our level of performance are a good value for the price that those boards are sold for.

Nobody wants their boards to be too expensive. And they also don't want them to be bargain-basement cheap. They want the sweet spot, where the bulk of boards are sold, which is $149 to $199.

That's the problem Voodoo 2 will have—3Dfx will be constrained by the number of people willing to pay $299 for a graphics board. That number is relatively small even within its niche market, the real extreme enthusiasts.

The problem with products at the lower end is the chips selling in that space had to be closed out. They had to get rid of them. They only get cheaper if you wait. So you sell things for the best price you can get.

boot ***So did you classify the Rendition part in that category?***

Kirk I don't think it's competitive with any of the Riva-based boards.

boot ***Why not?***

Kirk It's not as fast. The visual quality is probably pretty close, maybe better in some ways and worse in other ways. But the performance just doesn't stack up.

boot ***Actually Rendition's V2200 benchmarks are neck-and-neck with the Riva, yet it only has a 64-bit memory bus. Why isn't your 128-bit card's lead larger?***

Kirk Because Rendition's competing with our benchmark numbers from six months ago, just like Intel was. It hasn't seen our second release. Our new drivers will use more of the data path, and then you'll see us pull further ahead.

boot ***Who's your closest competitor?***

Kirk We'll compete with Intel and we currently compete with ATI. In spite of the fact that everybody wants to compare us with 3Dfx, we just don't ever see them in competitive situations. It's a completely different market.

boot ***Where do you see nVidia in two years and do you see some of your competition dropping out?***

Kirk Last year, 40 or 50 companies were all going to be the next predominant 3D-graphics

CPU and bus interface chip vendors trying to compete with them."

Absolutely Fab

boot ***You're currently a fabless company; any plans to change?***

Kirk I don't think it makes any sense for us to get into the fab business. Technology shifts are so quick. We have an opportunity to partner with the world's leading manufacturers. Since we're a high-volume and high-profitability chip, everybody would love to work with us. There are no issues with capacity.

boot ***SGS-Thompson has been your partner from the beginning. What's your relationship with SGS-Thompson going forward?***

Kirk We'll continue to work with SGS-Thompson. It's been a great partner, providing us with a lot of chips. But we're now wrapping up a second source to augment the volumes, because SGS hasn't been able to provide the volumes our customers demand.

boot ***What kind of fab problems is SGS-Thomson having?***

Kirk It's strictly capacity. We're dominating the capacity of an entire fab at SGS-Thomson. Demand from our customers is extremely high. We're supplying the high-end consumer SKUs for Dell, Micron, and Gateway, as well as STB and Diamond through the retail chain for add-in cards.

boot ***Any truth to the rumor that SGS-Thomson won't be doing your NV5 chip?***

Kirk I don't think a decision has been made about who is going to fab it at this point.

"I believe Voodoo was the **best product of** >

"Intel made a **mistake** with the **MMX** transition by really hyping it before it

supplier. Some of them have already been shaken out, and I expect a lot more will fall by the wayside over the next year or two. Companies leave the graphics business at about one a week now, because it's getting very, very hard to compete. We have to be the one to obsolete our own products and to come out with the next fastest product. Everybody who has been a leader in the past and then lost the lead got complacent and stopped working hard and stopped beating their own products and let somebody else get in ahead of them. We need to be vigilant to not do that.

And I don't think you'll see a lot of new people entering this market. The Riva 128 is about the size of the Pentium. And our next generation is the size of a Pentium II. You can't just jump in and make one of those. It's a $20 million investment.

The combination of strong players already in the market is going to prevent venture capitalists from funding some new startup. So the only people who can enter the market anew are the big players, like Intel. And it's going to be very difficult for them to move fast.

boot ***What do you think of Intel's 740 technology?***

Kirk I think i740 is a fine piece of technology [smirks]. And it would have been very competitive last year. I'm really glad it didn't come out last fall.

It's in the performance class of a Riva 128. Actually it's slightly slower, so it's very difficult to enter the market late with this slower part. Intel really undershot the market by building a 64-bit part. So it has fill-rate limits, and as benchmarks and games move to 800x600, it's going to be fill-rate bound. As CPUs move to 350 and 400 and 450MHz, it's going to be fill-rate bound. It's going to drop away.

However, Intel has considerable marketing muscle and will really help us legitimize the 3D market.

boot ***But doesn't Intel's massive marketing muscle scare you in any way?***

Kirk Well, you've got to be scared of somebody 1,000 times your size—it could accidentally step on you and not even know!

boot ***Do you think Intel underestimated the importance of 3D?***

Kirk No, but I think it did underestimate the time it would take to integrate the technology and get to market. Intel's not nimble like a small company such as nVidia.

The other thing Intel underestimated was our moving target, nVidia's performance. And in the meantime our drivers have given us another 50% in performance. In terms of performance, we're ahead and accelerating because our product treadmill introduces a significant major new product every six months.

boot ***Is Intel capable of that?***

Kirk I don't believe it is. To do that in the CPU space, it needs three or four teams overlapping and leapfrogging in parallel. It probably has at least two teams working on graphics now. Each of those is doing its first product and just learning the market. And that's very hard.

This is not where its expertise lies and a high-performance 3D chip now has about the same complexity as a CPU. You need people who know the technology cold. The nVidia team is composed of people who've been doing 3D graphics for 15 or 20 years.

boot ***nVidia pioneered the 128-bit memory bus on a 3D accelerator. But others are sure to follow. What's nVidia going to do to stay ahead of the pack?***

Kirk The 128-bit bus has given us an extreme advantage in terms of not even having to worry about the pixel rate speeds. As others do the same, they're going to have to go through the same process we went through in the past six months of tuning drivers and reordering the work to take advantage of that bandwidth. It doesn't work if you haven't carefully analyzed the work the driver does to make sure the CPU doesn't wait for you to organize the work.

And we're coming out on 128 bits with the Riva 128 ZX, which will support 8MB of memory and AGP 2x. I don't know of anybody else who is going to 128 bits.

boot ***What the heck is the Riva 128 ZX?***

Kirk That's the 8MB 2x AGP version of NV3, and it will be shipping both in add-in cards and OEMs this spring.

boot ***Any changes to the chip itself?***

Kirk It's not final yet, but we may change the clockrate. We could run Riva 128 faster than we do. We haven't done it in the past because it's not the bottleneck. So we may look at doing that for more headroom.

boot ***How much will the ZX cost?***

Kirk Roughly the same ballpark as Riva 128.

boot ***So the current Riva should drop in price?***

Kirk I can't make that prediction; I just make the chips. But that would be a good prediction.

boot ***Was it a mistake to limit Riva to 4MB?***

Kirk It's hard for me to say that anything about the NV3 is a mistake because it's the most successful 3D graphics chip ever. I will say that our next product, the Riva 128 ZX, extends to 8MB and also adds 2x AGP support. We're going to be shipping that product in volume this spring. And the Riva 128 will become the low-end product.

boot ***What memory technology shows more promise: RAMBUS or DDR SGRAM? Or something else entirely?***

Kirk The next exciting memory technology is integrated DRAM, which brings together

< *the year, but it has approximations. There are texture addressing problems covered up by excessive*

wrapping up production, and I think it's afraid of doing the same thing with AGP”

DRAM and graphics chips all on a single chip. That's the dark horse at this point.

boot ***What's the benefit of integrated DRAM?***

Kirk Vastly increased bandwidth. The only reason RAMBUS is interesting is because you're able to get higher bandwidth into the RAM. If your RAM's integrated with the rest of the graphics, the connection isn't through pins. It's just on some bus inside the chip, so it can be 128 bits, 256 bits, 1K, 4K. It's easy.

boot ***Will the Riva's SGRAM hit a wall eventually?***

Kirk With any VLSI technology there's going to be a point where you won't be able to reduce the geometry any more and you won't be able to put more transistors on a chip each year.

But within the next year or two, I think you're going to begin to see PC graphics chips able to do everything, in terms of both performance and quality, that has been done in workstations or supercomputers—and that's really exciting.

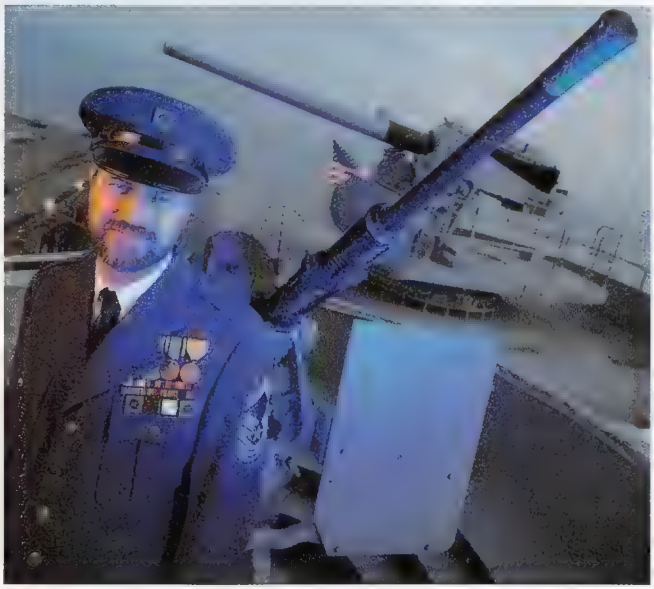
At that point, you have to start looking at new opportunities. How do you make pictures more real than anyone's made before? How do you support animation? Or things like motion blur, reflections, shadows, very realistic lighting, very complex smooth skinned models and characters? You want to get to the point where rather than saying “That's a pretty good computer graphic of a tree. Why are you showing me that?” You want that tree to be indistinguishable from reality and you want to create a fantastic tree that couldn't possibly exist in reality, but is believable because of how detailed and finely rendered it is.

Graphics have huge growth potential.

boot ***Spill the beans on your next chipset.***

Kirk The NV4, which will be called Riva4, will show this spring, and we'll ship later in the summer. It'll be two to three times faster in performance than the Riva 128. It's fully optimized for D3D 5 and 6, as well as OpenGL. It'll be the first mainstream performance 3D processor to support full multitexture rendering. The fill rate is large enough where we're not a bottleneck. We've increased the peak triangle rate from five million to well over six million just to make sure we continue to have headroom.

We'll also support up to 24-bit floating-point z-buffer; and in both OpenGL and Direct3D DX6 we'll support stencil buffering—which allows you to mark which pixels on the screen have been touched by a particular operation. For example, it's a way of doing reflections with a mirror. You can draw your scene, redraw the outline of the mirror with the stencil tag, and then draw the reflection, but the reflection only gets written where it's the stencil tag. So you can build up reflections and shadows and great lighting effects with the stencil buffer. I think it's going to be a very important feature this year.



boot ***Do you have any performance projections for the Riva4? Frame rate and things like that?***

Kirk We'll be limited by CPU performance, so I expect our fill rate with Riva4 will be in the ballpark of two Voodoo 2s with SLI. And our texturing rate matches. But there are no benchmarks. You bump up against this wall and faster products don't measure any faster. So that's why we decided to push the quality with the Riva4.

boot ***How much memory will the Riva4 support?***

Kirk We'll support 16MB configurations. I can't say whether we're going to support four or not. We'll respond to pressure from our PC customers, but we think eight is the sweet spot.

boot ***What kind of clockrates are you talking about for the Riva4?***

Kirk That's a choice we haven't made yet. We're going to look at where we are with respect to the CPUs and decide how much headroom we need. One thing we've done is upgrade our hardware interface to require less interaction with the CPU to kick off a triangle for DX5 and also for the new DX6 interface. And we've also added some OpenGL hardware support.

boot ***What will the minimal processor be for the Riva4?***

Kirk The Riva4 will just get faster as you add more processing power to it. So you might ask, “What's the slowest processor *Quake* could run on at 30fps?” We'll

The Green-Eyed Monster

boot ***The Riva 128 is also known as the NV3. Tell us the full NV1 story.***

Kirk When NV1 was being built, the graphics and sound and game controller parts of the PC were very fragmented. There weren't unifying standards; there wasn't a single platform. So if you were developing a PC game, you had to support 50 different graphics cards and a bunch of different soundcards. It was really hard and the PC wasn't a platform, it was just a collection of almost unrelated things that just happened to be sharing the same processor.

NV1 was envisioned as unifying all the non-CPU parts of the platform into a single standard. There were graphics, audio, and Sega game ports.

But PC vendors and OEMs didn't want to buy an integrated graphics and sound chip; they wanted to buy a graphics chip, they wanted to buy a sound chip, and they wanted to mix and match those independently to optimize their costs. So the NV1 wasn't a good solution for them.

The other problem was timing. There was no API momentum, in terms of the software developers united behind a common API. So trying to introduce a new architecture and API to the software developers at that point was just too much to push through.

It probably sold as many units as any of the game console chips for the PC, but it wasn't really a mainstream product.

boot ***And what happened to the NV2?***

Kirk NV2 was a custom product that we did for a specific customer. We're not allowed to talk about who they are, but the product never shipped.

boot ***So it died in development?***

Kirk It was a great opportunity because it allowed us to develop technology on someone else's dime. With NV1, we learned the dos and don'ts of working with the PC architecture, such as how to get VGA right. It sounds easy, but you have to do it. And with NV2, we learned a lot more about texturing strategies and about different ways of rasterizing and more about the 3D pipeline. We were able to pull all those pieces together and NV3 was built from start to finish in under nine months. And I don't think anybody else has built a competitive 3D product in that kind of time frame.

filtering, so Voodoo textures are quite blurry.”

probably do that with a 166.

boot ***How much will Riva4 cost?***

Kirk I'd expect it to be in the same ballpark as the Riva 128: $149 to $199. Look at DRAM, you're paying about a dollar a megabyte. You're going to see huge memories on PCs and graphics cards. That really points to a graphics chip that has a high fill rate and supports large resolutions and large memory rates.

boot ***What will distinguish Riva4 from Voodoo 2?***

Kirk We support full 32-bit color rendering at full speed. One of the things people don't talk about very much is multipass texturing. If you're only doing 16-bit color 5-6-5, after you blend it a few times you begin to get some strange banding and pattern effects. We'll see this on Voodoo 2, but you won't get those effects with 32-bit color.

boot ***Will this be the Achilles heel of the Voodoo 2?***

Kirk I think that's going to be a significant weakness. We're going to be hands-down the quality leader with Riva4. We're doing a very solid implementation of per-pixel mip-mapping. We do isotropic filtering, which has better quality than trilinear. It blurs less without anti-sparkling. I expect that people will be really stunned by the quality we're able to provide.

boot ***Is full-screen anti-aliasing an important feature? Or is it just a one trick pony some players will attempt?***

Kirk In the next year or two, that will become a mainstream feature and will be expected. Everyone will have it and you won't talk about it. It'll be what you do. On a 3D workstation, you just wouldn't accept not having anti-aliasing. And the same thing will be true eventually in the PC space.

You'll see some anti-aliasing this year, but it'll cost in terms of performance and the implementations won't be very good. Most vendors are just learning; they haven't been doing it for 20 years.

boot ***And we're talking edge anti-aliasing?***

Kirk Yeah. Essentially people already do texture filtering. Mip-mapping is texture anti-aliasing. There's also time anti-aliasing (motion blur). Both are common. What's remaining is edge anti-aliasing. We will offer full-scene edge anti-aliasing at a slight performance penalty with the NV4. We think higher resolution is going to be a better choice for people, but we offer a choice.

boot ***What kind of performance hit?***

Kirk It depends how far you're pushing the fill rate, because it burns some of the fill rate. So if you're not running at high resolution and running into fill-rate limits, it may have no impact on performance. But if you're trying to run at 800x600 or 1024x768, you may run into fill-rate limitation.

boot ***Why did nVidia abandon its native API?***

Kirk I don't actually remember what the API was called. The reason for abandoning it was that it's not a particularly good idea. Proprietary APIs are anticompetitive and not a way to really further the 3D market. We are very, very interested in increasing the adoption and penetration of high-performance 3D and standard APIs to unify the industry. Competing on performance and features along the same path is best for consumers. Proprietary APIs fragment the market and make it harder for developers to target what they're doing and more difficult for consumers. It's much better for consumers to buy a card because it runs all the games. They just buy the fastest card that does the best pictures.

We worked very closely with Microsoft in defining DX6. The Riva4 is probably the only chip with a full implementation of all the DX6 features. We could be the reference implementation.

We have a very good relationship with the DirectX developers. Our lead time is much longer than theirs, so I don't want to say we drive what they're doing, but we have to lead what they're doing. We get some ideas from where they're going and vice versa.

boot ***If you're a D3D card only, do you ever need to interface directly with game developers?***

Kirk We're not a D3D card only. We also support OpenGL fully because our customers demand it. And by the time this is printed, we'll have released our full OpenGL ICD on both Windows 95 and Windows NT. And I believe it will be the fastest full OpenGL implementation since 3Dfx's implementation. Our target level performance is in the Voodoo 2 class with NV3.

Right now we're at 39fps in *Quake II* at 640x480. And we're at 34fps at 800x600. What we've been working on so far is OpenGL compliance. And now we're going to do performance tuning. We've done simulations and we think we're going to end up in the high 40s or low 50s.

boot ***Still, other companies, such as 3Dfx, Rendition, and PowerVR especially, have the resources, the money, and the time to court developers.***

Kirk We should worry about that because there's a certain amount of education that needs to occur with developers for them to understand what kind of operations are expensive and what kind of operations are efficient. An example is when developers use D3D to draw independent triangles versus drawing strips or meshes. Strips or meshes are much faster because you only have to transform the shared points that come together once. If they're independent, it might be the same point, but the hardware doesn't know, so you end up doing useless work. So those are kind of things that we can help to teach developers.

Some developers are already very sophisticated with 3D; others are just learning and there's a lot of hard mistakes we prefer they didn't have to make.

boot ***Has Microsoft ever put pressure on nVidia not to support OpenGL?***

Kirk Microsoft pushes us to do more and faster. We've been a great help in their evangelism efforts. But we're really API agnostic. If you ask me to make a choice, I don't really care. The important part is that it is a standard that is supported across the industry.

boot ***If the standard is the all-powerful force, what do you want to see happen to native APIs, such as Glide and Rendition?***

Kirk They're really shooting themselves in the foot. Look at Rendition and 3Dfx and PowerVR. My numbers may not be exactly correct, but I believe Riva 128 shipped more

Control Console

boot ***Any plans to get your architecture into the home consoles? The PowerVR folks have been touting their presence in the next-generation Sega machine all to hell. Is that something nVidia would want?***

Kirk Absolutely, but that's going to be driven by the evolution of the PC. Extrapolate that forward a year or two and it's very likely that the low-cost PC just eats the console market.

boot ***So you're not afraid of the Playstation 2 or Nintendo 128?***

Kirk Well, you might see nVidia chips in a Playstation 2 or the Nintendo 128. If they're going for the best performance, we expect to be the performance leader.

boot ***What about the arcade space?***

Kirk We're members of the Open Arcade initiative and we've also been selected by a couple of arcade manufacturers to integrate Riva 128 into their systems. So we're not directly in the arcade business, but by providing a high-performance solution on a standard platform, we will get penetration in that market.

> *"I think i740 is a fine piece of technology [smirks]. And it would have been very competitive last year."*

> *"Only in the last year have more than a million people had 3D >*

"How I fit 1 speeding downtown bus, a crippled lunar lander, and 5 car-tossing tornados into a 4 INCH SQUARE."

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in 1997 alone than all those have ever shipped combined. That's really a testament to this fragmentation I'm describing. They're just limiting their markets by being proprietary. And I think it would be better for all concerned if they were willing to play in the mainstream.

boot ***What do you think of alternate architectures like Talisman or PowerVR or Oak?***

Kirk They're very interesting. Talisman was poorly timed in that it answers a question nobody has to ask anymore. Talisman reduced memory-bandwidth cost with partitioned rendering that allowed you to access the frame-buffer memory less and conserve frame-buffer memory. But at a dollar a megabyte, who cares?

boot ***Is Talisman is dead?***

Kirk People continue to do Talisman implementations. I believe two are still happening, but the only one I'm familiar with looks like the chipset alone is going to cost about $150 to make and will be almost as fast as Riva 128. So I don't really think it's a viable economic alternative at this point.

boot ***What about PowerVR's claims that its tile-based rendering is more efficient than the traditional 3D pipeline?***

Kirk We've evaluated pilot architecture and have done performance simulations and haven't been able to produce one that measures up to our basic brute force, fast and wide data paths. It's hard to beat 128 bits.

And there are problems with a tiled architecture. If you're doing rendering in a tiled order, you actually collide with some of the semantics of DirectX. For example, if you mix 2D operations such as blitz with 3D operations, you do some 3D rendering, then you flip it around and do some more 3D rendering. You just can't do that with a tiled architecture and you'll fail Microsoft's WHQL, which means you can't ship in mass-market PCs. So until that problem is fixed, it's kind of a serious drawback.

boot ***What game have you pulled off the shelf in the last three months and said, "My God, this is absolutely great"?***

Kirk *Quake II* is awesome. It's the pat response. I'm sure you just hear way too much of it, but it's what they did with the models, the moving parts and the lighting.

boot ***What could id have done better?***

Kirk id could have managed the texture memory better and not expended as much memory in some areas and then have the ability to have higher-resolution textures for the walls and things like that. The biggest weakness, and not just *Quake II* but all the running-around-in-a-bunch-of-rooms games, is that the wall textures are still fairly low resolution. As you take advantage of AGP, you can have a lot more textures and really bump up that level of detail. Also, with multitexture you can have repeating wall texture and a detailed texture, which breaks up the repetitiveness, then lighting texture, and a slight amount of gloss for the reflection map. Do two passes with multitexture and you get a more interesting look with a lot more complexity.

boot ***Does it concern you that most of today's top-selling games are low-brow 2D titles such as* Barbie Fashion Designer, Tonka Search and Rescue, *and* Riven*?***

Kirk I don't care. Those sell to the lowest common denominator and it's only in the last year that more than a million people have 3D accelerators. I mean real 3D accelerators. I don't count the S3 products as real accelerators. So now there's a foundation for a market for 3D games and entertainment products on the PC. There'll be 10 or 20 million real 3D chips sold soon. Even so, I expect more of that, because even *Barbie Fashion Designer* would be better if it was *3D Barbie Fashion Designer*.

boot ***Is it bad that new products are being developed so fast? Readers write in and say, "Man! Just when I got my Riva 128, I'm already hearing about the next-generation processor."***

Kirk I don't think it's a bad thing, but if you have to blame somebody, blame Intel. It pushed the product treadmill by coming out with a significantly different CPU every six months. And that pushes PC OEMs to make a new platform every six months. And we're determined to fit into that world and deliver a great 3D graphics product every six months.

I guess when you buy a PC, you should expect to replace it every year. But you don't need a whole new PC just to run Excel faster. So rather than buying a new PC, you can spend $200 on a new graphics card and get performance that's a lot more exciting. That extends the life of your PC investment and that's less painful for consumers.

But really, if you think about it, it's great to see everything get faster every year. I go out and get the latest and greatest. **b**

RIVA
VMB
VMB

< accelerators. I mean real 3D accelerators. I don't count the S3 products as real accelerators."

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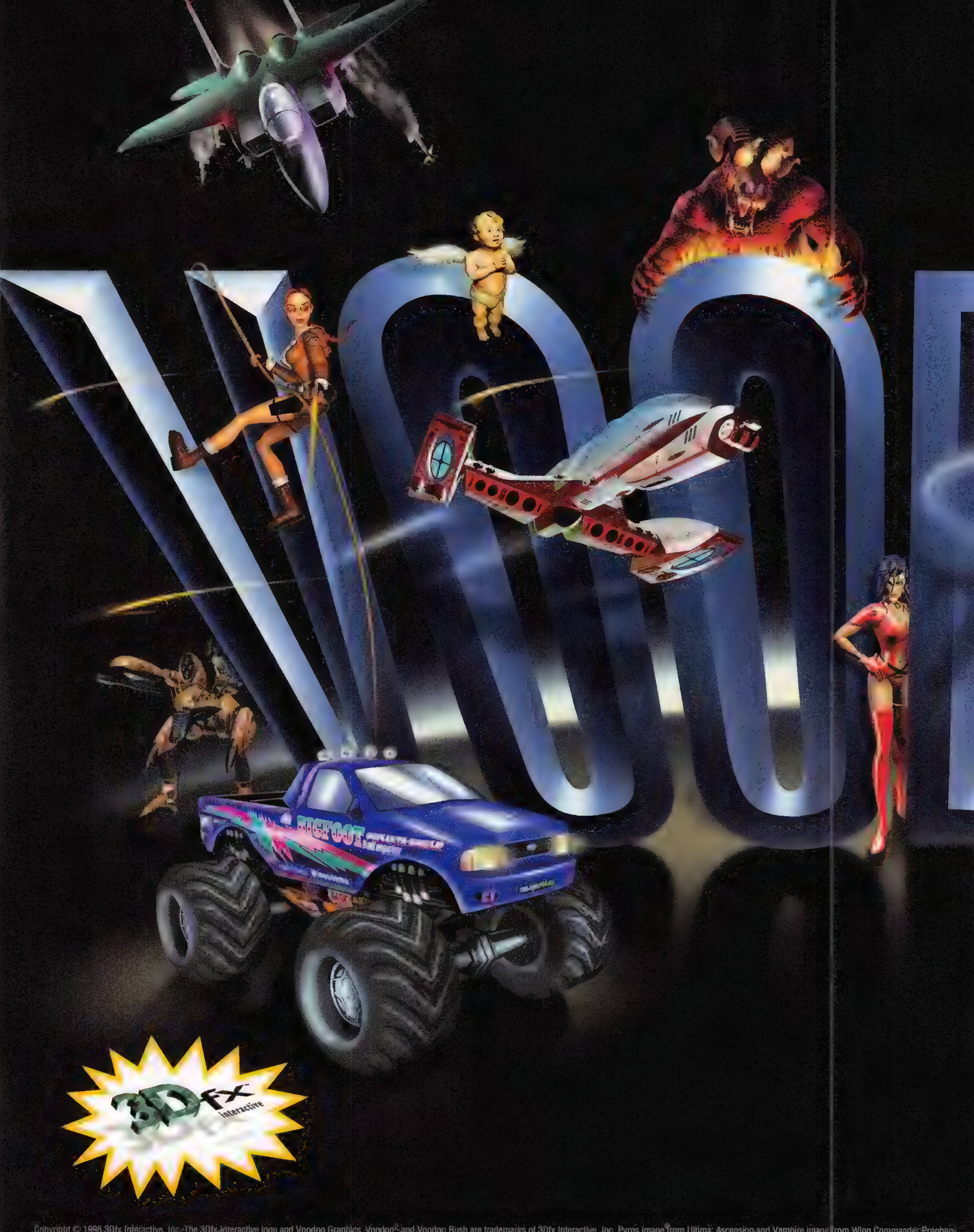

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NOTEBOOK AUTOPSY

A piece-by-piece dissection of computer science's most mysterious mutation

Notebooks.
Mysterious black boxes. Pure PC Power
packed in impossibly small spaces. You see notebooks everywhere, but understand so little about what makes them tick. These technological mutations hide their secrets well, but this much we know: They are passive entities, nonviolent, and incapable of human emotion. | Sure, you can ask questions if you like—"What's inside the case?" or "How can so much power and capacity fit in such a tiny cavity?"—but you'll never receive a straight answer from the people at "tech support" or from the "user's manual" that shipped with your machine. Someone doesn't want you to know the truth. | Yet the truth must be told. Damn the grisly details and gory photographs. The truth must be told. | So, in the cover of darkness, we made our way into Micron Technology's top-secret laboratory hidden in the seemingly quiet community of Nampa, Idaho. We overpowered one of the company's highest-ranking engineers, plied him with sodium pentothal, and forced him to break the silence that has shadowed the PC notebook industry for years. Together we dissected the Micron TransPort XKE, a 233MHz powerhouse that received a coveted 10 bootVerdict in *boot* 17. | Suffice it to say, our suspicions have been confirmed. Notebook computers are silicon wonders; triumphs of the economy of miniaturization. | Now, for the first time, the shocking truth can be told. Follow along as we unveil the engineering mysteries of notebook computers.

—*Bryan Del Rizzo*

Did you know? **The LCD is the most expensive component in any notebook. The hinge on the LCD, by the way, is rated on the number of times it opens and closes. This hinge in the notebook we dissected is rated and tested to meet or exceed more than 7,000 openings • The mini-LCD isn't limited in scope or purpose to system-status icons. Potentially, any information can be piped through this part. A special bootPrize goes to any reader who can hack his mini-LCD to be a rear-view mirror for *Quake* • The only way to coax more power from a notebook is to go into the BIOS and**

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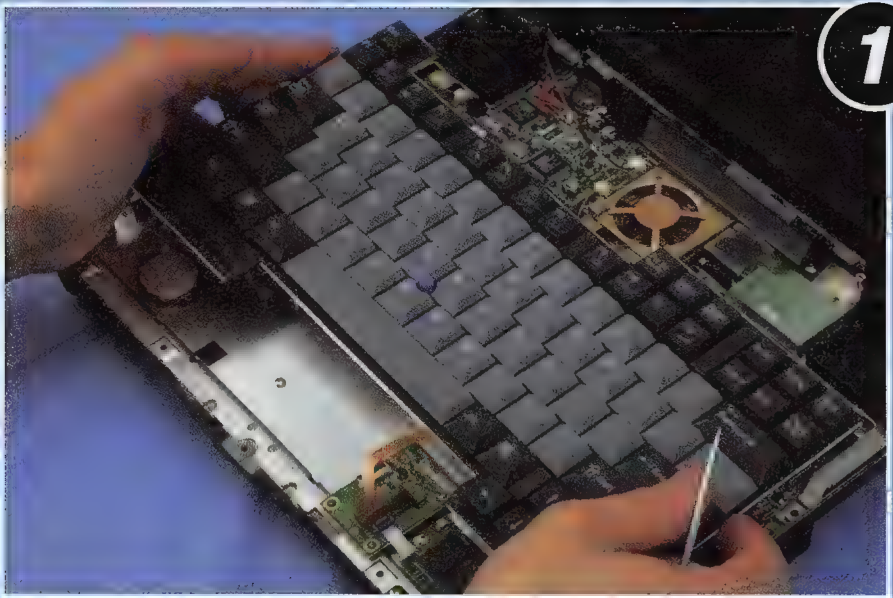
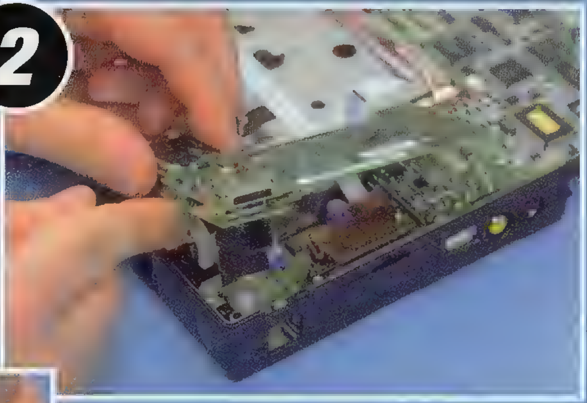


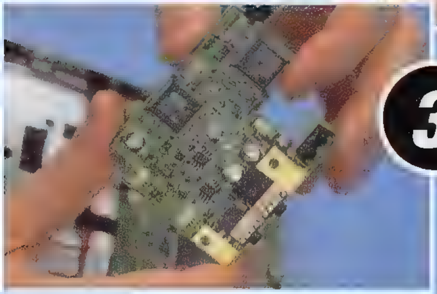
1 KEYS & CABLES

Just like desktop systems, notebooks are stuffed with intestinal cabling. They use two types of cable leads: ink-painted and tin. Ti[illegible] leads (silver-colored) are [illegible] but are more durable and c[illegible] inserted and extracted with[illegible] painted leads (black-colore[illegible] found on the keyboard connector, tend to wear down over time. So why would a notebook company bother to use the more expensive tin leads for devices that defy *boot*-style upgrading? Well, machines do have to be repaired once in a while, and tin leads help accommodate the service technician and ensure overall repair reliability. While ink leads may have to be replaced after about 20 extractions, tin leads can last up to ten times longer.

2 GAMEPORT AND MODEM

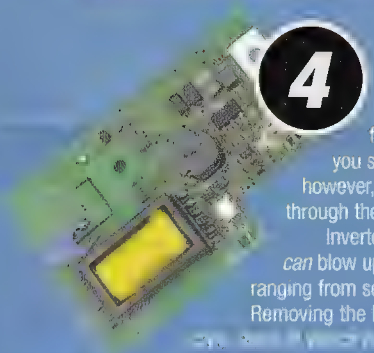
Most notebook manufacturers don't typically bother bolting the gameport in place—it's usually buttressed into position by several other components and a cable. But this notebook's joystick/MIDI port (the brown board directly underneath the L-shaped modem) is screwed onto the motherboard using a solid metal mounting.





3 SOUND CARD

Just about every component in a notebook must be reduced in size—real estate is far more precious in the mobile landscape. And the miniaturization doesn't come cheap. However, this notebook uses the same 100-pin TQFP ESS1879 FM sound chip found in desktops. The ESS692 chip provides the robust wavetable-synth engine.



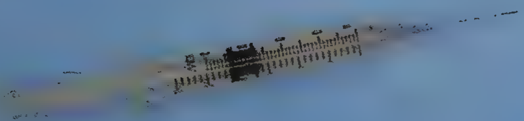
4 VIDEO INVERTER AND LCD CASE

You may have noticed that some LCD screens are positioned slightly to the right or left of center. There's a good reason for that—the video inverter, which takes five volts and turns it into 2,000v of power for the LCD's backlight. The inverter, you see, is too thick to place directly behind the LCD, so the part typically finds refuge off to the side of the screen. Micron, however, has beaten the problem by integrating the inverter into the motherboard. Power connections to the LCD are routed through the right hinge.

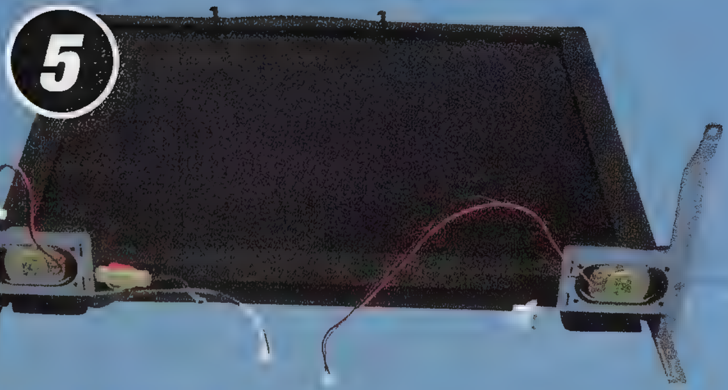
Inverters generally aren't connected by screws and can easily be popped in and out. Like any other active notebook part, they *can* blow up. But it's rare. You're more likely to experience a hard drive failure or fan malfunction. An inverter has a life span ranging from seven to ten years, so even if it does die, the CPU would most likely already be outdated.

Removing the LCD case is a chore. Although only four screws need to be removed, the glass is held in place by 21 interlocking [illegible] pulsating effects.

> tweak specific bit settings. But even then, the notebook would probably just overheat and eventually shut down. Notebooks afford *no* room for heat increases • Besides the power battery, the only other battery in the entire notebook is on the motherboard. It's used for holding the CMOS BIOS setup information • The bigger the power supply, the less it'll cost. Desktop power supplies may cost only $10 a piece, but a miniature version for notebooks can cost up to $200 • Black notebooks aren't allowed for sale in Germany. The CE marketing certification spec prohibits it • There are three gold-plated screws in the Micron notebook. Gold screws are used



LIQUID CRYSTAL DISPLAY

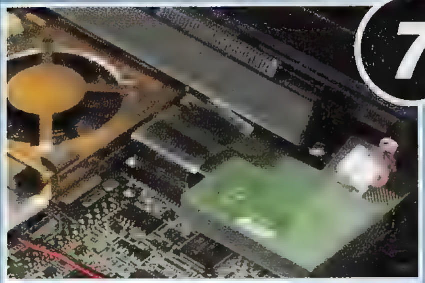


The LCD panel contains 1,024 horizontal and 768 vertical lines. At each intersection is a Thin Film Transistor (TFT). Each transistor (you can call it a pixel) consists of three dots—in standard RGB format—resulting in 2,359,296 dots. It's virtually impossible to create a perfect LCD; out of all those dots, some are destined to fail. [illegible] [illegible] if more than 20 dots (or seven pixels) are whacked, or if there are six whacked dots (two pixels) within 10mm of each other on a [illegible].1-inch LCD (the distance is 5mm for a 13.3-inch screen).

FAN ASSEMBLIES

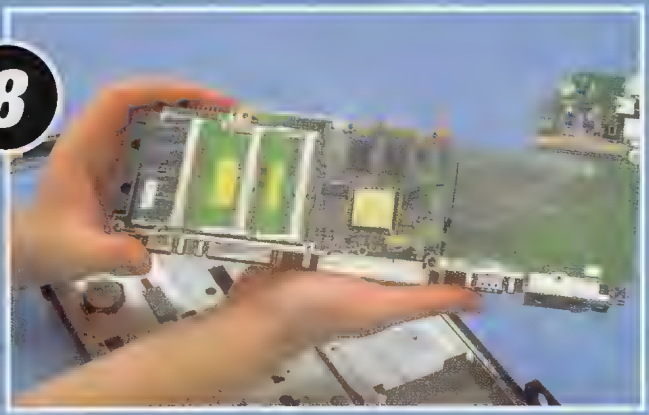
[illegible] the heat plate, which is connected directly to the CPU. The fan doesn't actually start kicking in until a thermostat (positioned only 2mm away from the CPU) reaches a few degrees within Intel's safety spec.

Other cooling sources include both device bays, the metal chassis (which is used as a passive heat conductor), and the copper cord, which helps direct the heat flow up through the plate. Once the fan kicks in, air is drawn through the keyboard as well as the sides and bottom of the case, and then is blown out the back. With a Tillamook 233MHz, the fan will kick in about 10% to 20% of the time.



MINI LCD

[illegible] true for the mini-LCD. Subjecting it to extreme cold or heat, or poking it with your finger or a ball-point pen, is a bad idea. And the mini-LCD is a lot more delicate than the already sensitive main LCD. You may think pressing down hard on the mini-LCD to look at all the icons simultaneously is kind of cool, but it's not; you can severely damage it.



MOTHERBOARD

Many notebook components are securely mounted with screws bored into the motherboard or exterior chassis, but other parts, including the gameport, modem, and LCD inverter, are actually held in place by the surrounding components. Many of these individual pieces are actually double-sided and stacked on top of each other. Take the motherboard, for example. You can easily identify the PC card drive, the north and south bridges, the third small outline DIMM slot (notebook DIMMs are smaller than desktops DIMMs), and hard drive connectors. But unless you physically remove the PC card drive, you'll never unearth the video subsystem hidden underneath.

Because a notebook motherboard contains thousands of parts (some of which can't be seen by the naked eye), manually assembling one would not only be time-consuming, but a logistical nightmare. So notebook manufacturers designed an automation scheme—the waveflow process.

You start with a big, blank, green PC board. You then attach all the resistors and capacitors using an adhesive solder paste (any parts that actually penetrate the board may also be soldered by hand). You next place the board in the waveflow machine. As the board moves through the machine on a conveyor belt, the surface mount technologies (SMTs), such as graphics chips and other integrated circuits, are affixed in rapid succession, much like a machine gun firing multiple rounds of ammunition. Once one side is finished, the board is flipped over and the waveflow process begins on the other side. After all the parts are affixed, the board toddles along into an oven where the solder paste liquifies and secures the SMT parts more permanently. Next the board is cooled off and rinsed in a special cleaning solution that removes excess solder paste and ensures that all the contacts are sound. The more parts affixed via the waveflow process, the better the overall reliability. Even better, this entire process can take as little as ten minutes, depending on the board size and complexity.

POWER SUPPLY

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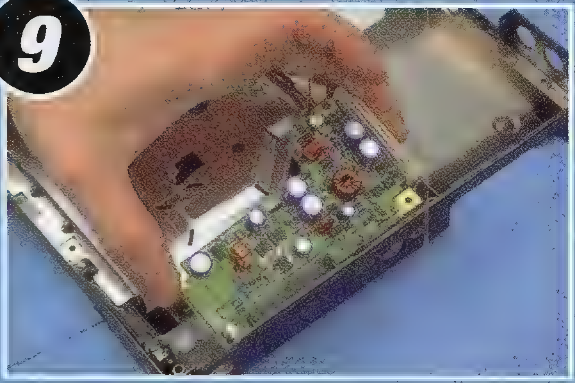

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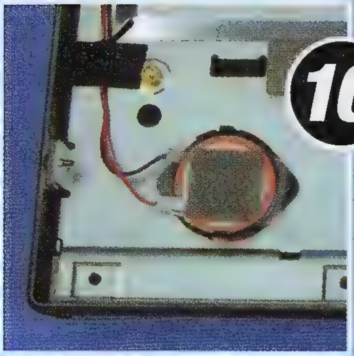

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BATTERIES

[illegible]

CPUS, VOLTAGES, AND OVERCLOCKING

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[illegible]

[illegible] notebooks, the voltages for [illegible] pins used to interface with other com- [illegible]

[illegible] b

> in areas where grounding and conductivity are vitally important (for example, the LCD) • The development cycle for a notebook can take up to one and a half years. For a PC, the cycle can be completed in as little as three months • The most expensive part of a notebook is the LCD. The CPU is second • Notebooks use special plastics with built-in ElectroMagnetic Interference (EMI) shielding. The LCD cable contains more EMI coating than any other component • Speakers are covered with either screen mesh or cloth. Mesh is stronger and doesn't dampen the volume, but lets in more dust • There is no linear scale between size of the components and their power consumption

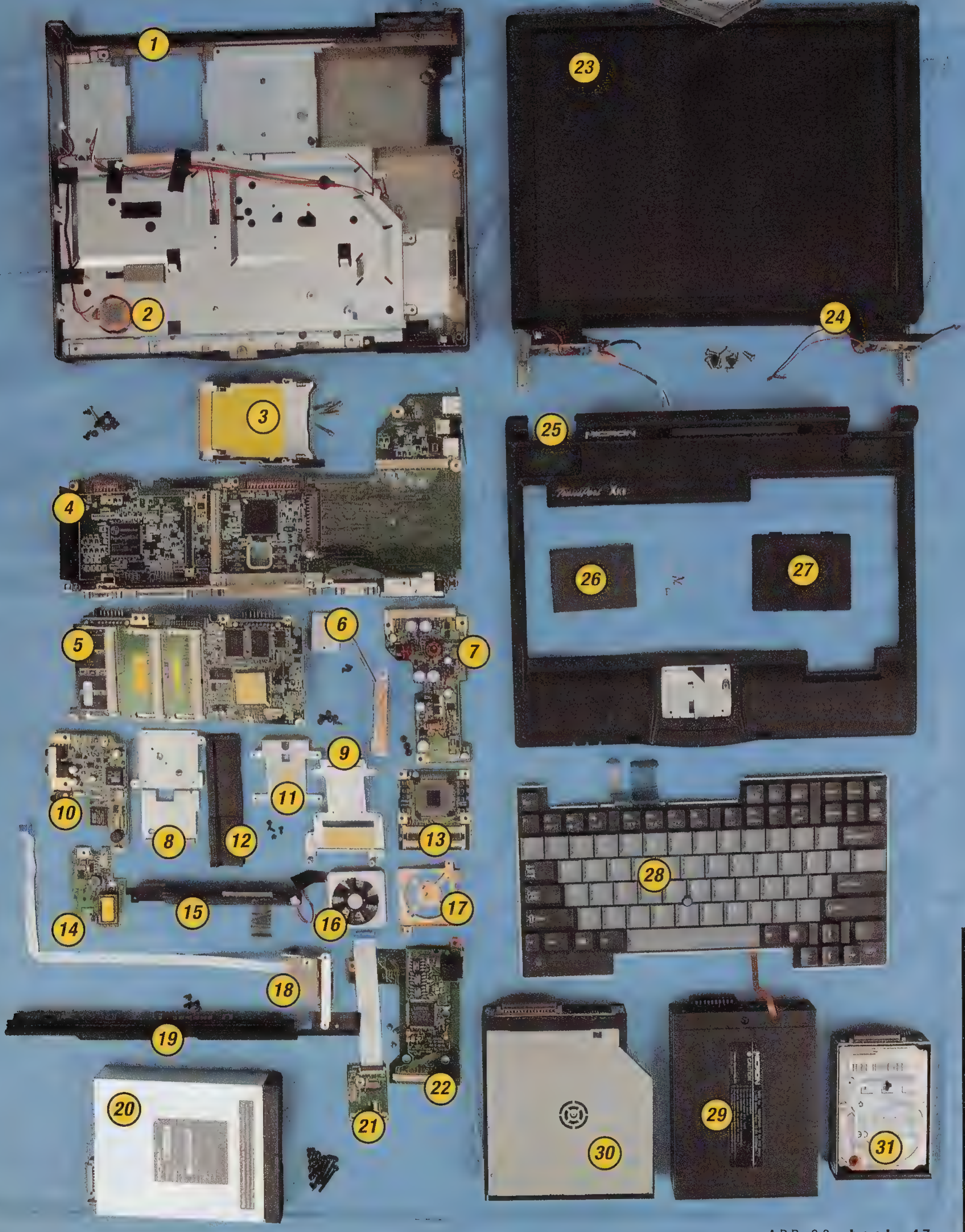
30

GORY DETAILS

The notebook dissection took just under two hours to complete. The operation could've been completed in mere minutes if we'd wielded our screwdrivers with impunity, but we decided to document the process with photography and probe all the innards as they were removed from the case. In all, we removed a total of 82 components. Here's a full breakdown:

1. Chassis
2. Warm Swap Battery
3. PC Card Holder
4. Secondary Motherboard
5. Primary Motherboard
6. Heat Pipe
7. DC-DC Board
8. Bottom Fan Bracket
9. CPU Mount
10. Sound Card
11. Heat Transfer Plate
12. I/O Door Covers
13. CPU Board
14. Inverter Board
15. Mini LCD
16. Fan
17. Fan Cover
18. Gameport
19. Mini LCD Cover
20. Floppy Drive
21. Junction Board/POB
22. Embedded Modem
23. LCD & Cover
24. Speakers
25. Speaker Covers
26. Mouse Pad
27. Mouse Pad Support
28. Keyboard
29. System Battery
30. CD-ROM Drive
31. Primary Hard Drive

52 Miscellaneous screws and parts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Public Displays of Affectio

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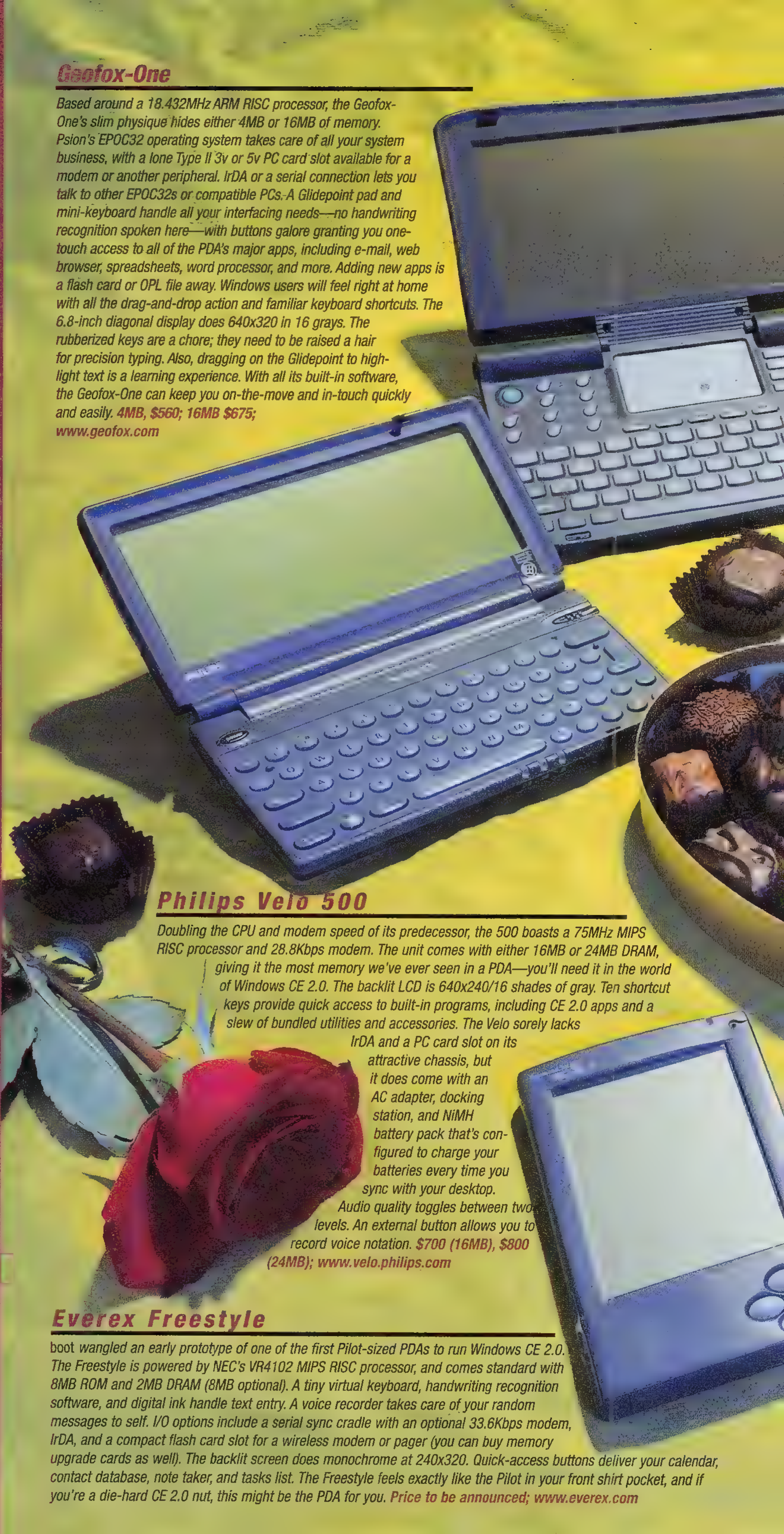
Do you love your PDA or do you *lov* [illegible] **Personal Digital Assistant** [illegible] standing in movie [illegible] strolling [illegible] sexier playmate **This year's** pageant of [illegible] 3Com's PDA, the beguiling **Palm III**, [illegible]



Geofox-One

Based around a 18.432MHz ARM RISC processor, the Geofox-One's slim physique hides either 4MB or 16MB of memory. Psion's EPOC32 operating system takes care of all your system business, with a lone Type II 3v or 5v PC card slot available for a modem or another peripheral. IrDA or a serial connection lets you talk to other EPOC32s or compatible PCs. A Glidepoint pad and mini-keyboard handle all your interfacing needs—no handwriting recognition spoken here—with buttons galore granting you one-touch access to all of the PDA's major apps, including e-mail, web browser, spreadsheets, word processor, and more. Adding new apps is a flash card or OPL file away. Windows users will feel right at home with all the drag-and-drop action and familiar keyboard shortcuts. The 6.8-inch diagonal display does 640x320 in 16 grays. The rubberized keys are a chore; they need to be raised a hair for precision typing. Also, dragging on the Glidepoint to highlight text is a learning experience. With all its built-in software, the Geofox-One can keep you on-the-move and in-touch quickly and easily. ***4MB, $560; 16MB $675; www.geofox.com***

Philips Velo 500

Doubling the CPU and modem speed of its predecessor, the 500 boasts a 75MHz MIPS RISC processor and 28.8Kbps modem. The unit comes with either 16MB or 24MB DRAM, giving it the most memory we've ever seen in a PDA—you'll need it in the world of Windows CE 2.0. The backlit LCD is 640x240/16 shades of gray. Ten shortcut keys provide quick access to built-in programs, including CE 2.0 apps and a slew of bundled utilities and accessories. The Velo sorely lacks IrDA and a PC card slot on its attractive chassis, but it does come with an AC adapter, docking station, and NiMH battery pack that's configured to charge your batteries every time you sync with your desktop. Audio quality toggles between two levels. An external button allows you to record voice notation. ***$700 (16MB), $800 (24MB); www.velo.philips.com***

Everex Freestyle

boot wangled an early prototype of one of the first Pilot-sized PDAs to run Windows CE 2.0. The Freestyle is powered by NEC's VR4102 MIPS RISC processor, and comes standard with 8MB ROM and 2MB DRAM (8MB optional). A tiny virtual keyboard, handwriting recognition software, and digital ink handle text entry. A voice recorder takes care of your random messages to self. I/O options include a serial sync cradle with an optional 33.6Kbps modem, IrDA, and a compact flash card slot for a wireless modem or pager (you can buy memory upgrade cards as well). The backlit screen does monochrome at 240x320. Quick-access buttons deliver your calendar, contact database, note taker, and tasks list. The Freestyle feels exactly like the Pilot in your front shirt pocket, and if you're a die-hard CE 2.0 nut, this might be the PDA for you. ***Price to be announced; www.everex.com***

Sharp Mobilon HC-4100

This Windows CE 2.0 device comes with a MIPS RISC R4000 processor, 12MB EDO RAM, built-in 33.6Kbps modem, IrDA port, and Type II PC card slot. You also get a voice recorder and an optional PC card digital camera to send 8-bit/11KHz WAV files and 640x480/16-bit color JPEGs to friends. The 6.5-inch diagonal 640x240 touch screen does 16 grays, is backlit, and lacks ghosting or artifacting. Seven dedicated one-touch application keys send you straight to your e-mail, contact database, calendar, task list, and pocket versions of MS Word, Excel, *and* Internet Explorer. *The Mobilon is a big step forward for Sharp, but beware: The unit won't fit in your breast pocket, the keyboard is soft, and the system is wont to intermittently lock up for a few seconds despite the booming memory allotment. Look for our future review of the HC-4500 and its color display.* ***$699 (camera $399); www.sharp-usa.com***

MessagePad 2100

This Apple gadget is bulky, but can sync with your Windows PC, and with three more megs of DRAM, it races past its sluggish predecessor. Armed with a 160MHz StrongARM SA-110 RISC processor, the 2100 has 8MB ROM, 4MB DRAM, and 4MB flash memory for storing user data. The Newton OS 2.1 has the coolest system sounds in PDAville, and runs a word processor, e-mail client, web browser, spreadsheet app, calendar, and address book, among other mini-apps. Handwriting recognition has been improved (Apple says the software has a 93,000 word built-in dictionary), but if it still drives you psycho, you can use the generously sized virtual keyboard or a $90 optional mini-keyboard that plugs into your serial port. The 480x320 LCD does 16 grays and is 5.9 inches diagonal—that about an inch less than the competition, but a width of 3.3 inches makes the screen seem bigger than the others we've played with. Besides the serial port, you get IrDA and two Type II PC card slots. No word yet on whether the Newton division is in it for the long haul, or ready to hang up the cardigan and call it a night. ***$1,000; www.apple.com***

Texas Instruments Avigo

Based on TI's "highly customized and proprietary Z80 processor" (the actual specs are shrouded in secrecy), the Avigo will make Pilot wannabes think twice. It's only slightly larger than the 3Com pocket delight, but still small enough to fit in your breast pocket. The 240x160 backlit screen provides enough luminescence to guide you around a darkened room. Even better, you can orient in either letter or landscape formats. For text entry, the Avigo provides a virtual keyboard as well as a system called T9, which divides the entire alphabet into nine squares, each containing three letters. As you tap each square, the Avigo checks its built-in dictionary and begins deciphering the word you're tapping out, displaying alternate words based on possible approximations. The unit ships with Lotus Organizer 97, *but if you cough up the cash for a full version of Puma's IntelliSync, you'll be able to sync other PIMs (including* ECCO Pro, ACT!, *and* Outlook*) via the Avigo's serial PC Link or IrDA port. Native software includes a scheduler, memo pad, calculator, doodle pad, world clock, and expense tracker. Four basic games and a developer's API can be downloaded directly from TI's web site. No third-party apps are available—yet.* ***$299; www.ti.com***

3Com
Palm III

Palm III

Following the colossal success of its previous PDAs (which garner some 70% of the handheld market), Palm Computing follows up with the third generation of its pocket prize, the aptly named Palm III.

The first thing you'll notice about the new model is how much smaller it feels in your hand or pocket. Surprise! The Palm III shares the same dimensions as previous iterations, but clever component manipulation has allowed the designers to ergonomically smooth the device's corners, creating a much more compact feel. The redesign also results in a much sturdier construction that's better equipped to survive the bangs and bruises of the real world.

A new stock flip cover, reminiscent of old Star Trek *communicators, also protects your screen. And tucked into the case is a sleek new metal stylus whose head screws off to reveal a secret pin for hard resets in the field.*

In addition to an expanded 2MB of memory, the Palm III's most notable new feature is the much-requested IrDA port, which allows Palm III users to share records and apps, including an innovative e-business card that shoots through the ether in less than a second. While the V-Card device is fully IrDA compliant, Palm has no immediate plans to sync it directly with PCs (but the company has confessed that it's open to licensing the project).

On screen, the Palm III runs under the third incarnation of the svelte Palm OS. This new version sports a few cosmetic touch-ups, including better font choices and a view-by-list option in the launcher, which can now divvy up apps by category. And when it comes time to upgrade to Palm OS v.4.0, you won't need to buy a whole new memory chip, as was previously the case. The Palm III is flash upgradable.

For current Pilot and PalmPilot users, two upgrade routes are available. Owners of all models can purchase a software/memory/IR upgrade for an estimated $150 (the final price may vary). This doesn't add the backlight feature to pre-PalmPilot models, so vanilla Pilot users have the option of trading in their current PDAs for $75 towards the purchase of a Palm III.

Based on our hands-on experience with the Palm III, it looks like Palm has another winner on its hands. ***$399; palmpilot.3com.com***

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DID F22 ADF™ - Ocean	YES	YES	YES	YES	YES
iF22™ - iMagic	NO	NO	NO	NO	NO
F22 Raptor™ - NovaLogic	NO	NO	NO	NO	NO
JFIII™ - Interplay	NO	NO	NO	NO	NO

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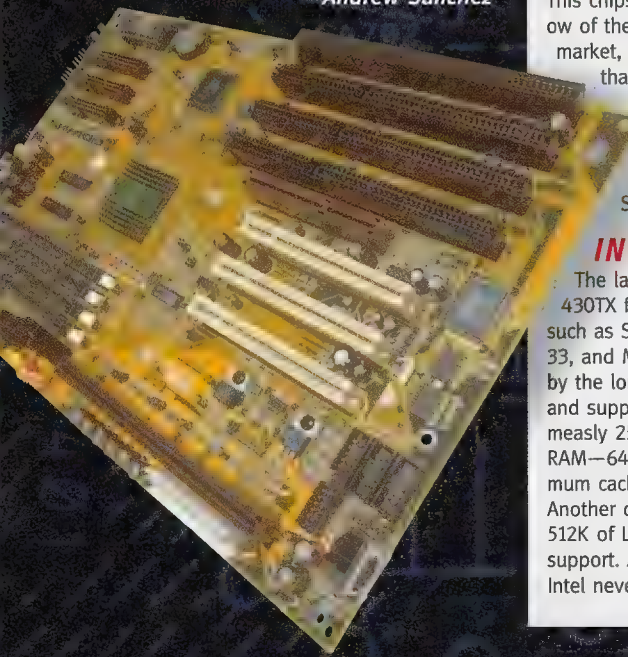
Product Information Number 261

YOUR PERSONAL TECH **BRIEFING** ON THE **CONCEPTS** AND **COMPONENTS** THAT MAKE UP THE **PC** EXPERIENCE

this month:

Core Logic Chipsets

That new K6 or Pentium II may be the heart of your dream machine, but the core-logic chipset is its all-powerful soul, taking care of all those things that can make or break your motherboard. Wanna roll with 100MHz SDRAM and AGP? Go crazy with USB? Fire up the latest, fastest CPU? Your chipset had best be ready to handle the madness.
—Andrew Sanchez



SOCKET 7 PCISETS/AGPSETS

The following core-logic chipsets are designed for folks hangin' with the Zero Insertion Force crew—such as Intel's Pentium MMX, AMD's K6, Centaur's WinChip, and Cyrix's 6x86MX.

INTEL 430FX

intel
PCIset
SB82437FX-66
L5253552
S2999
INTEL © '94

One of the oldest Socket 7 PCIsets (a.k.a. Triton back when Intel was naming PCIsets after sea gods), the 430FX established Intel's iron-grip on the core-logic industry. This no-frills chipset handles up to 128MB of EDO DRAM (with 64MB cachable). Given that it doesn't support many modern features, the 430FX is relegated to bargain-bin motherboard status, although the 430FX *does* support ancient 60MHz non-MMX Pentiums—a boon considering the latest chipsets only support 90MHz and above.

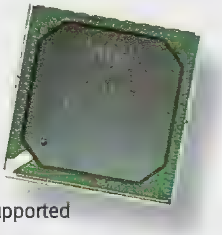
INTEL 430HX

Thanks to its deep-posting and FIFO buffers and dual-CPU support, the 430HX (a.k.a. Triton 2) was a favorite among those wanting to concoct cheap NT servers. Originally conceived for high-end applications and capable of handling up to 512MB of EDO DRAM (fully cachable via an external tag RAM, and 64MB without), the 430HX is still used in dual-Pentium motherboards by a variety of mainboard makers today. USB support and DMA bus mastering made this an excellent single CPU chipset as well. But the lack of SDRAM support doomed it to a slow death.

INTEL 430VX

This chipset lived under the performance shadow of the beefier 430HX. Aimed at the home market, the 430VX is a single CPU solution that can't handle its bigger brother's copious amount of memory (maxing out at 128MB with 64MB cachable). So the only enhancement the 430VX could muster was SDRAM support.

INTEL 430TX



The last of Intel's Socket 7 PCIsets, the 430TX fell dreadfully short. Despite features such as SDRAM support, USB, Ultra DMA/ATA-33, and MMX support, the 430TX was stymied by the lone CPU limit and support for a measly 256MB of RAM—64MB maximum cachable. Another dent was the 512K of L2 cache support. And while Intel never officially supported system-bus speeds past 66MHz, some mainboard makers have pushed the 430TX into the 83MHz realm, although stability may be compromised at these speeds.

VIA APOLLO VP2/97

A staple of motherboard makers wanting a non-Intel chipset motherboard, VIA Technologies' superior specs and performance are gaining acceptance. Among the older VIA PCIsets, the VP2/97 is a hefty beast capable of handling all manner of CPUs and coming correct with up to 512MB of EDO or SDRAM memory (all of it cachable) and up to a whopping 2MB of L2 cache. All your favorite peripherals such as USB, Ultra DMA/ATA-33, and MMX are present. Despite the company-endorsed 66MHz speed limit, it revs to 75MHz without much trouble. The only thing missing from the mix is AGP.

VIA APOLLO VP3

Improving on the solid performance of the VP2, the Socket 7–based VP3 throws a whopping 1GB of main memory into the mix (yes, all of it cachable) on top of the 2MB L2 cache, as well as support for AGP. The VP3 supports AGP 2x Execute mode.

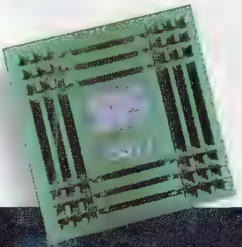
Look for non-Intel AGP motherboard support for VP3 from Tyan, EPoX, FIC, and others, to hit the market hard in the first half of this year. While some boards will give you 83MHz, the VP3 runs into one major bottleneck—no 100MHz system-bus support.

VIA APOLLO MVP3

You should have seen this one coming—the Apollo MVP3 core-logic chipset adds 100MHz system-bus support to the VP3 architecture. To enable 100MHz capability, VIA developed Virtual Clock Synchronization (VCS). A proprietary design, VCS employs Delay Lock Loop (DLL) technology crucial to high-frequency CPU, DRAM, and AGP buses in Slot 1 and Socket 7 system designs.

The VIA Apollo MVP3 will be compatible with all Socket 7 processors and throws in support for 1GB of FP/EDO/SDRAM and DDR SDRAM II memory, AGP 1x and 2x, and the ubiquitous 2MB of L2 cache. The MVPs should be available later this year.

SIS 5571



Another favorite among the non-Intel clique, SiS's 5571 is considered a 430TX killer. 512MB of main memory is your

The Core Logic Chipset Checklist

Chipset	CPU Supported	Maximum RAM	Maximum L2 Cache	RAM Support	System-Bus Speeds	Maximum PCI-Bus Speed	AGP Support/ Level	USB Support	# Of CPUs Supported	UltraDMA/ ATA-3 Support
Intel 430FX	Intel Pentium MMX, AMD K5	128MB	512K	FP, EDO	66MHz, 50MHz	33MHz	NO	NO	1	NO
Intel 430HX	Intel Pentium MMX, AMD K5,K6, Cyrix M1	512MB	512K	FP, EDO	66MHz, 50MHz	33MHz	NO	YES	2*	NO
Intel 430VX	Intel Pentium MMX, AMD K5,K6, Cyrix M1	128MB	512K	FP, EDO, SDRAM	66MHz, 50MHz	33MHz	NO	YES	1	NO
Intel 430TX	Intel Pentium MMX, AMD K5, K6, Cyrix M1, M2, IDT WinChip C6	256MB	512K	FP, EDO, SDRAM	83MHz, 75MHz, 66MHz	33MHz	NO	YES	1	YES
VIA VP2/97	Intel Pentium MMX, AMD K5, K6, Cyrix M1, M2	512MB	2MB	EDO, SDRAM	83MHz, 75MHz, 66MHz	33MHz	NO	YES	1	YES
VIA VP3	Intel Pentium MMX, AMD K5, K6, Cyrix M1, M2	1GB	2MB	EDO, SDRAM	83MHz, 75MHz, 66MHz	33MHz	YES/2x	YES	1	YES
VIA MVP3	Intel Pentium MMX, AMD K5, K6, K6+3D, K6 3D, Cyrix M1, M2, IDT WinChip C6	1GB	2MB	DDR-SDRAM, SDRAM	100MHz, 83MHz, 75MHz, 66MHz	33MHz	YES/2x	YES	1	YES
SiS 5571	Intel Pentium MMX, AMD K5, K6, Cyrix M1, M2	512MB	512K	EDO, SDRAM	83MHz, 75MHz, 66MHz	33MHz	NO	YES	1	NO
SiS 5581	Intel Pentium MMX, AMD K5, K6, Cyrix M1, M2	512MB	512K	EDO, SDRAM	83MHz, 75MHz, 66MHz	33MHz	NO	YES	1	YES
SiS 5591	Intel Pentium MMX, AMD K5, K6, Cyrix M1, M2, IDT WinChip C6	768MB	1MB	EDO, SDRAM	100MHz, 83MHz, 75MHz, 66MHz	33MHz	YES/2x	YES	1	YES
OPTi Vendetta 82C750	Intel Pentium MMX, AMD K5, K6, Cyrix M1, M2	512MB	512K	EDO, SDRAM	66MHz	33MHz	NO	YES	1	YES
AMD 640	Intel Pentium MMX, AMD K5, K6, Cyrix M1, M2	512MB	2MB	EDO, SDRAM	83MHz, 75MHz, 66MHz	33MHz	NO	YES	1	YES
AMD 640 AGP	Intel Pentium MMX, AMD K5, K6, K6+3D, K6 3D, Cyrix M1, M2	512MB	2MB	DDR-SDRAM, SDRAM	100MHz, 83MHz, 75MHz, 66MHz	33MHz	YES/2x	YES	1	YES
ALi Aladdin IV+	Intel Pentium MMX, AMD K5, K6, Cyrix M1, M2	1GB	1MB	EDO, SDRAM	83MHz, 75MHz, 66MHz	33MHz	NO	YES	1	YES
ALi Aladdin V	Intel Pentium MMX, AMD K5, K6, K6+3D, K6 3D, Cyrix M1, M2, IDT WinChip C6	1GB	1MB	DDR-SDRAM, SDRAM	100MHz, 83MHz, 75MHz, 66MHz	33MHz	YES/2x	YES	1	YES
Intel 440FX	Pentium Pro, Pentium II Slot 1	1GB	dependent on CPU	FP, EDO	66MHz	33MHz	NO	YES	2	NO
Intel 450GX	Pentium Pro	1GB	dependent on CPU	FP, EDO	66MHz	33MHz	NO	NO	2	NO
Intel 450KX	Pentium Pro	4GB per pair	dependent on CPU	FP, EDO	66MHz	33MHz	NO	NO	4	NO
Intel 440LX	Pentium II Slot 1	1GB EDO, 512MB	dependent on CPU	EDO, SDRAM	66MHz	33MHz	YES/2x	YES	2	YES
Intel 440LX-R	Pentium II Slot 1	1GB**	dependent on CPU	EDO, SDRAM	66MHz	33MHz	YES/2x	YES	1	YES
Intel 440BX	Pentium II Slot 1/Slot 2	1GB	dependent on CPU	DDR-SDRAM, SDRAM	100MHz, 66MHz	33MHz	YES/2x	YES	2	YES
Intel 450NX	Pentium II Slot 2	1GB	dependent on CPU	DDR-SDRAM, SDRAM	100MHz, 66MHz	33MHz	YES/2x	YES	4	YES
Micron Samurai	Pentium Pro, Pentium II Slot 1	1GB	dependent on CPU	EDO, SDRAM	66MHz	66MHz	NO	YES	2	NO
Compaq HPSA	Pentium Pro, Pentium II Slot 1	3GB	dependent on CPU	EDO, SDRAM	66MHz	33MHz	NO	YES	2	NO
VIA VT82C680 Apollo 6	Pentium Pro/Pentium II Slot 1	1GB	dependent on CPU	EDO, SDRAM	66MHz	33MHz	NO	YES	2	YES
SiS 5601	Pentium Pro/Pentium II Slot 1	>512MB	dependent on CPU	EDO, SDRAM	66MHz	33MHz	YES/2x	YES	2	YES

*Intel CPU only. **limited by DIMM. Some motherboards armed with the SiS 5591 are marked with 100MHz system-bus speeds—it has yet to be determined whether the chipset supports it.

maximum (EDO or SDRAM), but 512K is all you get for L2 cache. While it does support USB, don't expect dual-CPU support, AGP, or Ultra ATA. But it does support higher system-bus speeds for Cyrix 6x86MX processors.

SIS 5581

This interim PCIset provides Ultra ATA support but not much else. You'll need to jump to the 5591 series for AGP and all that cool stuff.

SIS 5591/95 AGP

Sporting many of the features of the 5571—including 768MB of EDO or SDRAM main memory, 1MB of L2 cache, and all those nifty peripherals you love—the 5591 has caused a minor dilemma regarding how fast can you push the system bus. The official company line is 66MHz, yet motherboard makers are pushing that all the way up to 100MHz.

OPTI VENDETTA 82C750

A major casualty when Intel came stompin' into the chipset market, OPTi has been eking out a living providing chipsets for overseas notebooks and desktop systems. The single-chip-solution Vendetta 82C750 offers up to 512MB of system memory (SIMM or DIMM), as well as USB and Ultra ATA support. But, with 512K of L2 cache and no AGP support, the Vendetta is feature limited.

AMD 640

With VIA as a close partner, AMD has its own core-logic chipset. The AMD 640 PCIset follows many of the features of the VP2, including SDRAM support, 512MB of main memory (all of it cachable), 2MB of L2 cache, Ultra ATA, and USB. System-bus speeds are officially set at 66MHz, but expect a 100MHz AGP-compliant part to appear when the K6 3D and K6+3D processors hit.

ALI ALADDIN IV+

A product of Acer Laboratories, the Aladdin IV+ handles bus speeds up to 83MHz, as well as 1GB of RAM (EDO or SDRAM and 512MB cachable via tag RAM). The 1MB maximum L2 cache size impresses, while Ultra ATA and USB are supported as well. The only thing lacking is AGP support, but the Aladdin V takes care of that.

ALI ALADDIN V

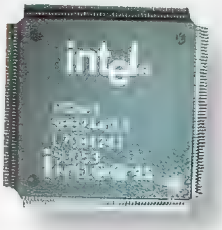
Recently announced and heading to a motherboard near you is the mega-fast Aladdin V. Building on the Aladdin IV+ PCIset feature set, Aladdin V will bypass the first-gen 66MHz AGP bus speeds and sport a 100MHz system-bus speed and full AGP 2x support. Pump in up to 1GB of SDRAM (all fully cachable), and expect board makers to pop in as much as 1MB of L2 cache. Ultra ATA and USB are also in effect.

Abit has announced plans for its IT5A Aladdin V–based motherboard—expect more to follow.

SOCKET 8/SLOT 1 PCISETS/AGPSET

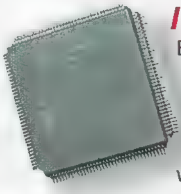
Considering no one in his right mind has attempted to clone the Pentium Pro processor, it's no surprise Intel has almost absolute rule in this 64-bit realm. But, lone patches of resistance are out there.

INTEL 440FX



Engineered for the Pentium Pro and recently the Pentium II scene, the 440FX is still the workstation workhorse. With support for up to 1GB of EDO DRAM, the 440FX can handle up to two CPUs, USB, and more. You can get bargain-basement boards based on this chipset for P-II systems, but it would be a waste. P-Pro owners, however, can still get these in droves.

INTEL 450GX/KX



Basically the 440FX with enhanced abilities, the 450GX supports dual–Pentium Pro configs, while the 440K, when installed with dual PCI bridges (PB) and memory controllers (MC), is for quad–P-Pro action. Designed for mondo workstations and servers, they rarely make appearances in consumer motherboards. The 450GX supports up to 1GB of EDO DRAM, while the 450KX handles a hernia-inducing 4GB of RAM per PB/MB combo. This old P-Pro–specific chipset supports the failed EISA bus.

VIA VT82C680 APOLLO 6

From those wacky folks at VIA comes this Pentium Pro/Pentium II–compatible chipset, the VT82C680 Apollo 6. Capable of handling up to 1GB of RAM, the Apollo 6 one-ups the 440FX by supporting SDRAM (as well as EDO DRAM) and Ultra DMA/ATA-33. The Apollo 6 can get a motherboard going with up to four P-Pro CPUs, but it's still unclear whether anyone can set up a P-II-based system with this chipset. As expected, AGP is a major missing component.

MICRON SAMURAI

Concocted in-house by Micron Electronics, the dual-CPU–capable Samurai PCIset handles up to a whopping 1GB of EDO or SDRAM and is the only core-logic chipset that supports a 64-bit PCI bus running at 66MHz (everyone else is chugging along at 33MHz). USB is also supported, but not Ultra ATA.

At home with either a Pentium Pro or P-II CPU, the Samurai's only weakness is its lack of AGP support; but the 66MHz PCI bus should keep naysayers quiet when massive 15MB+ textures come rolling its way. The only way you'll get this chipset is through Micron and its S18693 PTSAM dual–Pentium II ATX motherboard.

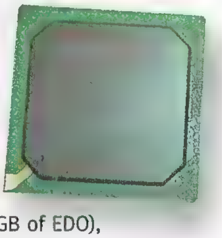
COMPAQ'S HIGHLY PARALLEL SYSTEM ARCHITECTURE

Designed by Reliance Computers, the Highly Parallel System Architecture is a core-logic chipset found only in Compaq's workstations. The HPSA is aimed specifically at hardcore server applications, handling up to 3GB of EDO or SDRAM! Quad P-Pro or dual–P-IIs are its calling, and it can handle USB with ease. While it doesn't support Ultra ATA, this chipset is suited for a SCSI lifestyle.

From its dual memory processing that promises over 1GB of memory bandwidth, to its Dual Peer PCI bus controllers that allow an aggregate I/O bandwidth of up to 267MB/sec, this core-logic chipset is ready to handle all the dual-processing nuances of a high-end server.

It doesn't support AGP or a 66MHz PCI bus, so future high-speed 3D graphics may be compromised.

INTEL 440LX



The 440LX represents one of Intel's major feature-rich chipset upgrades. Throwing in full AGP support (as expected), the 440LX supports up to 1GB of system RAM (512MB SDRAM or a full 1GB of EDO), as well as all the major features such as Ultra ATA, USB, and a host of power-saving features.

A big drawback is the 66MHz system-bus limit, although some boards allow up to 83MHz. This is a P-II specific chipset, so P-Pro users are out of luck.

INTEL 440LX-R

Expected sometime later this year, the 440LX-R will be a lower-cost version of the 440LX running at a 66MHz system bus. AGP is in full effect, and the 440LX-R will probably be launched alongside the cacheless P-II processors. Motherboards will be limited to two DIMM sockets, three PCI slots, one processor, and no error-correction code (ECC), so expect motherboard makers to embrace the new Micro ATX formfactor for 440LX-R systems.

INTEL 440BX

This is the beast everyone's waiting for. With a 66MHz or 100MHz system-bus speed, better data buffering, and up to 1GB of RAM support, the 440BX will be SDRAM (regular or DDR) only, so chuck those EDO DRAM modules. Single or dual Slot 1 or Slot 2 P-IIs will be supported.

With a refined, optimized AGP support in tow, if you team up the 440BX with the forthcoming PIIX6 Southbridge chip, you'll also get IEEE 1394 support and enhanced manageability thrown in for good measure. (See preview on p. 60)

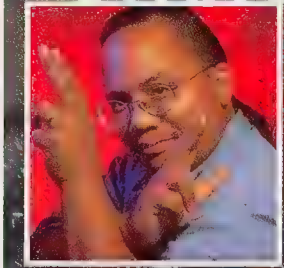
INTEL 450NX

Like the 450GX/KX before it, the 450NX is relegated to quad processors, only this time it'll be for Slot 2 processors. This AGPset will sport all the cool features of the 440BX.

SIS 5601

SiS's 5601 is forthcoming, but if its sister chipset, the 5602, gives any indication of performance, we can expect support for at least a 66MHz system bus, 512MB of EDO or SDRAM, Ultra ATA, USB, and more.

Handy Andy's Clinic-A-Thon



This month, senior editor **Andrew Sanchez** goes solo and wields his magic mojo on all the uppity **hardware parts** in the known universe.

Did You Sell Me Bad X?

I ran the 3D tests featured on bootDisc 17. *Final Reality* ran fine, but *X* ran terribly. The frame rate was excellent, but there were lots of white blocks where video should have been. I was using Diamond's Viper V330. What's wrong?

DrOctane

You need to do two things. First, get the latest Viper V330 drivers from www.diamondmm.com. *Second, try going into X's graphics settings and making some adjustments. Press F11 and then click OK. Now you'll see the Graphics Setting menu. Go to the Transp. texture format pulldown menu in the upper right-hand corner and switch between the various texture formats. Change one, then click OK and check your output. You may need to fiddle with this, and maybe even your "Normal texture format" setting, before you settle on an optimal setting. Take a peek at* www.egosoft.com *for more information and possible setting recommendations for your particular video card.*

Internal/External Modem Mix-N-Match

I'm currently beta-testing Windows 98 and want to add a second 56Kbps modem to try binding. Problem is, I'm out of ISA slots. Will I suffer a performance hit by using an external modem? I've never used an external, and I don't know if performance suffers by going through a serial port rather than an expansion slot. What do you think?

Mark A. Hiatt

Assuming you have the free IRQs and resources available, and your comm ports use a 16550 UART, you shouldn't see any performance hits (the modem itself is a bigger I/O bottleneck than the serial port). The biggest thing in your way, quite honestly, is IRQ availability.

Video Memory: Resolution Or Performance?

If I have two nearly identical video cards, but one has 2MB of video memory and the other has 4MB, will I see a difference in performance at 640x480/16-bit color? Or is video memory only used for greater color depths at higher resolutions?

Steve Alvarado

You'll definitely see a performance difference. By limiting your video memory to 2MB, you'll not only limit yourself to lower resolutions, but you'll also slight your 3D gaming hardcore. Many games require 4MB of local video memory for both Z-buffer and texture-storage duties. With only 2MB of video memory, many games will refuse to run. And even if the game decides to run, it will drop textures like mad. We saw this happen with the Packard Bell 233MMX machine, which had an ATI Rage with only 2MB of memory.

Who Is The Boss Of Whom?

I have two hard drives: an old Connor 420MB and a newer Maxtor 2GB. Currently the Connor is the master, with the Maxtor as the slave on the same ribbon going into the primary controller. The Conner is the master because it was there first and contains Windows 95. Should I change this? Would I get improved performance?

Michael Couillard

Change it. Subjugate the old, slow-as-a-slug Conner drive. By keeping it as your master and as your OS drive, you're dragging your computer through the mud. Use utility software such as DriveImage *or* DriveCopy *to help you move everything over. Once you make the switch, your system will be noticeably faster booting up and overall performance will be mucho better.*

"I'm currently beta-testing Windows 98, and I want to add a second 56Kbps **modem** to try **binding**. Problem is, I'm out of ISA slots."

What A Difference A File Makes

My AUTOEXEC.BAT and CONFIG.SYS are just about empty, save the CD-ROM drivers. What do you need in the AUTOEXEC.BAT and CONFIG.SYS in a strictly Win95 machine? Do these files serve a purpose anymore?

John Bellavigna

Many Windows-based products still rely on some AUTOEXEC.BAT and CONFIG.SYS settings for optimal operation. For example, if you own a 3Dfx Voodoo board, you'll see AUTOEXEC.BAT commands designating variables such as clock speed and refresh rate, as well as gamma correction. And many soundcards still initialize via your startup files. Other things, such as HIMEM.SYS, are still required by Win95 in order to boot properly. Even little things, such as the "set" command, can have repercussions within your Win95 world. Isn't backward compatibility grand?

TV-Out On The Outs

I have a DVD player with an MPEG-2 decoder card and a Diamond Viper V330 PCI card. Both work great where the computer monitor is concerned, but TV-out is a different story. My DVD movies show up fine coming directly from the MPEG card on an S-video cable, but if I switch to the Viper, I can't see a thing. Just lots of flipping images of my desktop (or the movie) on the TV screen. I've tried forcing Windows 95 to put out at 60Hz, but it makes no difference. Isn't it supposed to be easier than this?

Josh Criz

The Diamond Viper V330 is notorious for mediocre TV-out. Make sure you have the latest drivers and see if any special TV-out options need to be enabled. Setting your refresh rate to 60Hz or slower should make things easier for your TV, but if this doesn't work, go with the MPEG-2 decoder's output—you'll be happier.

Down And Out

What are the consequences of just turning off your computer and not going to "Shut Down"?

Harold

The biggest consequence—besides the fact that Win95 won't have any way of warning you to save any important work—is that your hard drive heads won't be properly "parked." By not locking down those hard drive heads into that special safety position, you run the risk of losing data if you move your computer around. Those heads will be bouncing around your platters, and if they hit a platter hard enough, data loss can occur.

Hard And Fast?

If I used the DMA setting on my hard drive under Win95, would I see a speed increase? I used it for the CD-ROM and noticed a 50% increase in speed. Would using the DMA settings on my hard drive slow down the processor or hog memory?

Constantine Krikos

Enabling DMA will result in lower CPU utilization, thus freeing up your processor to do more important things. In theory, you should notice a speed increase with file transfers. The best way to check is to benchmark your hard drive and time how long it takes to copy to and from your drive.

BIOS Biopsy

I'm having problems with updating my BIOS. My Pentium 100 has a Chain-tech motherboard with an Award BIOS. My system refuses to allow me to install the update because of a lack of memory. Also, when I use memmaker, I get a QEMM error. Any suggestions?

Eric Arnold

The best way to ensure those wacky flash BIOS programs work is to make a floppy boot disk consisting of only your HIMEM.SYS inside your CONFIG.SYS file. Do not add anything that will encroach on base memory, such as FILES= or BUFFERS= commands. This should allow the flash BIOS program to work its magic. If not, edit your boot disk so that it contains absolutely nothing. Then try it again. Remember to always clear your BIOS (via jumpers) to make sure no residual madness is left by the older BIOS. You'll need to go back in and re-adjust your settings for your particular system optimization. b

EACH MONTH, **BOOT** EDITORS GATHER THE **BEST** PRODUCTS IN A SPECIFIC **CATEGORY** AND DEEM THEM: **BOOTWORTHY**

MODE

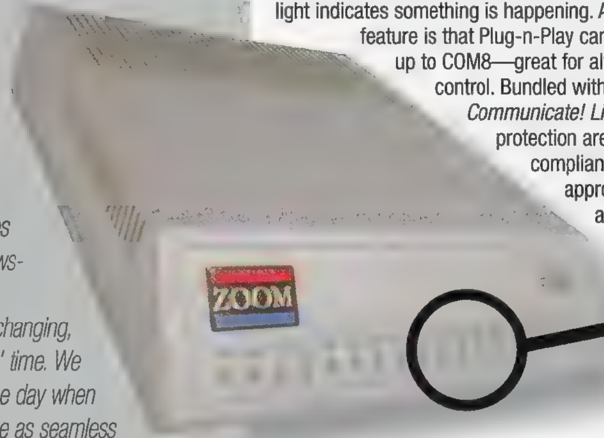
Faster is better. We're always looking for the next fix, whether it's for CPUs, RAM, hard drives, CD-ROMs, or especially modems. When you're browsing the net, it doesn't matter how blazingly fast your new Pentium II chip is if your Internet access is limited by the crappy connection to your ISP.

Modems are the weakest link in the chain. They inhibit you from getting your data injection, your updated driver, your alt.binaries .erotica.desktops newsfeed—now!

All this is rapidly changing, and it's about freakin' time. We can hardly wait for the day when Internet access will be as seamless and instantaneous as your local hard drive. But until then, we'll continue to be your pusher and keep dealing to you (for the price of a single issue of boot) all the juice you need to make an educated decision about what modem technologies to inject your PC with.

Zoom FaxModem 56Kx

There's something to be said for external modems: status lights! It's reassuring when the little blinking light indicates something is happening. And this little guy has no less than 14 LEDs. One potentially cool feature is that Plug-n-Play can be disabled on the internal version and the modem assigned up to COM8—great for alternate operating systems or for anyone who needs a bit more control. Bundled with the seven-year warranty and flash-memory upgradability is *Communicate! Lite* software. Distinctive Ring routing and ZoomGuard lightning protection are also standard features. Videophone-ready, it supports ITU H.324-compliant software and the V.80 video standard, assuming you have the appropriate A/V hardware already. The internal speaker is a much appreciated addition.



WE DIG THOSE K56, FAX, AND MSG LIGHTS.

product info

Price	$169
Company	Zoom Telephonics
Phone	800.631.3116
URL	www.zoomtel.com/k56/56k.html

Global Village PC Card 56Kflex Modem/Fax/10Base-T Ethernet

56 Kbps
Modem/Ethernet Card
Insert
GLOBAL VILLAGE

The only Kick Ass award *boot* has bestowed upon a modem was for another Global Village modem in *boot* 8, so it's a good bet that this micro powerhouse performs. Of course it's flash upgradable; of course it uses K56flex technology; of course it's a dual-port solution that allows you to use the modem and network simultaneously. But did you know it's cellular-ready for wireless communications? The smartly designed plug will detach itself under stress (and we don't mean the kind that *boot* editors face) to prevent damage to the card and your notebook. As if that weren't enough protection, it has built-in electrical and line-surge protection.

product info

Price	$299
Company	Global Village
Phone	800.736.4821
URL	www.globalvillage.com

THE CABLE CONNECTOR LOOPS BACK UPON ITSELF SEALING THE FEMALE JACKS TO PREVENT DUST AND DEBRIS FROM CONTAMINATING THE INSIDES.

MS

TO MAKE THOSE INTERNET CALLS CLEARER AND MORE PRIVATE, A HEADSET/ MIKE IS INCLUDED.

Jaton Explorer 56 Internal 56Kbps X2 DSVD/Voice/Fax

The Explorer 56 is the only X2-compliant modem in this roundup, mainly because K56flex seems to be the "standard" many manufacturers are using despite the fact that most of the world's larger ISPs are deploying X2 technology (AOL, Compuserve, and Prodigy included). The Explorer 56 by Jaton uses Cirrus Logic's FastPath 56K CL-MD565X ARM RISC chipset. It supports flash BIOS and caller ID, as well as the V.80 standard video-conferencing spec, and this particular model incorporates V.70 DSVD thanks to the CL-MD5650D echo cancellation subsystem. As with the Zoom modem, the PnP feature can be disabled to manually set the standard COM1-4 and the IRQs typically associated with them. Bundled is the robust *BitWare* by Cheyenne.

product info

Price $129
Company Jaton
Phone 408.934.9369
URL www.jaton.com

MultiMobile
Modem+Ethernet
56K
56K
MultiTech
systems

SIMULTANEOUS MODEM/LAN OPERATION PLUS A PROFESSIONAL PACKAGE—WHAT MORE CAN WE ASK FOR?

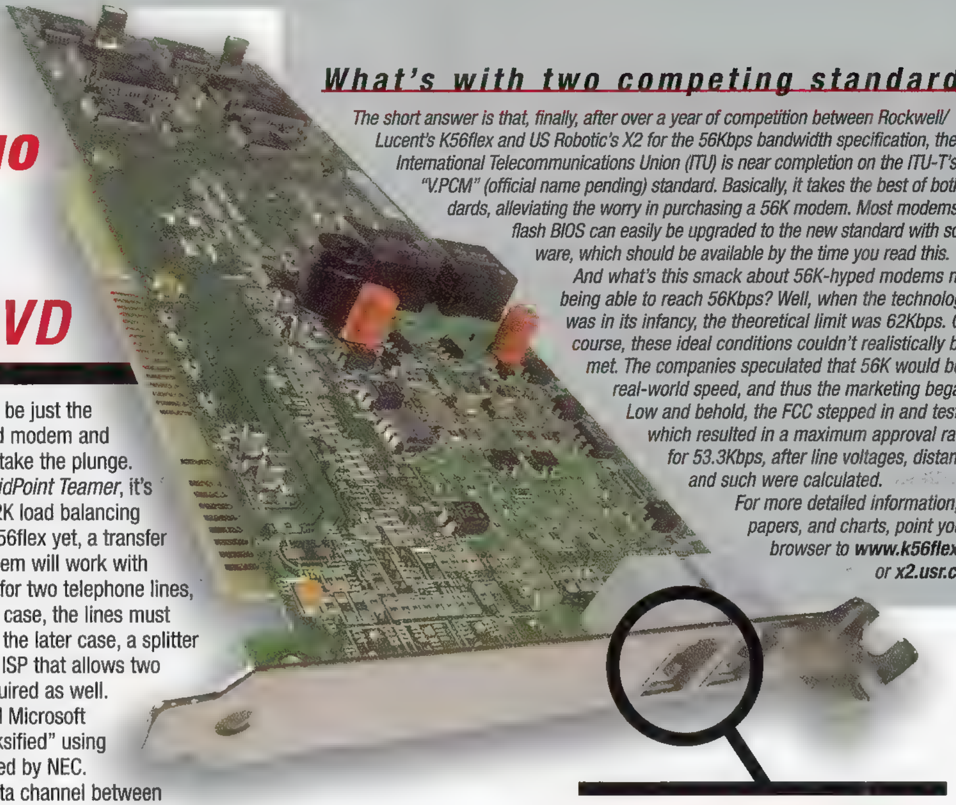
Multi-Tech MultiMobile MT5634ZLX/E K56Flex Modem+Ethernet PC Card

If the words modem and Ethernet are a requirement for your PC card consideration, this hot swappable PnP Type II bad boy from Multi-Tech should find itself at the top of your list. To address the first part of the criteria, K56flex technology ensures the top-speed performance you've come to expect on your desktop. While 10Mbps 10Base-T Ethernet connectivity allows for seamless integration with LANs. NE2000 compatibility is supported, as well as Windows 95/NT/3.1, OS/2 Warp, and Novell. Both sides are operable concurrently. The 5-foot Y-cable has manly RJ-45 and RJ-11 connectors, so no pesky bridging cables are required to get jacked in wherever you might find yourself. A comprehensive and detailed manual explains most every facet of the card—something severely lacking in many other vendors' products—and *Trio Communication Suite 5.0* are also included.

product info

Price $385
Company Multi-Tech
Phone 800.328.9717
URL www.multitech.com

Boca 112K DynamicDuo Internal K56flex Data/Fax SVD



Boca's full-length PnP ISA card might be just the intermediate step between a standard modem and an ISDN line for those too chicken to take the plunge. After installing MidCore Software's *MidPoint Teamer*, it's possible to take advantage of the 112K load balancing feature. For ISPs that don't support K56flex yet, a transfer rate of 67K isn't too shabby. The modem will work with either a single RJ-14 wall jack wired for two telephone lines, or two physical RJ-11 jacks. In either case, the lines must have independent phone numbers. In the later case, a splitter and coupler will be required. Also, an ISP that allows two logins or two Internet accounts is required as well. Some programs, such as the included Microsoft *NetMeeting 2.0*, will need to be "Socksified" using SocksCap32, a SOCKS protocol created by NEC. SOCKS establishes a secure proxy data channel between two computers in a client/server environment. From the client's perspective, SOCKS is transparent. From the server's perspective, SOCKS is a client. If one of the lines has caller ID, it will detect the incoming call and drop one connection to allow the call to proceed, when the call has ended, the modem will automatically redial the ISP number, reestablishing the high-speed connection. Boca is offering a free upgrade to the International Telecommunications Union (ITU) 56K standard when available.

What's with two competing standards?

The short answer is that, finally, after over a year of competition between Rockwell/Lucent's K56flex and US Robotic's X2 for the 56Kbps bandwidth specification, the International Telecommunications Union (ITU) is near completion on the ITU-T's "V.PCM" (official name pending) standard. Basically, it takes the best of both standards, alleviating the worry in purchasing a 56K modem. Most modems with flash BIOS can easily be upgraded to the new standard with software, which should be available by the time you read this.

And what's this smack about 56K-hyped modems not being able to reach 56Kbps? Well, when the technology was in its infancy, the theoretical limit was 62Kbps. Of course, these ideal conditions couldn't realistically be met. The companies speculated that 56K would be the real-world speed, and thus the marketing began. Low and behold, the FCC stepped in and tested, which resulted in a maximum approval rating for 53.3Kbps, after line voltages, distances, and such were calculated.

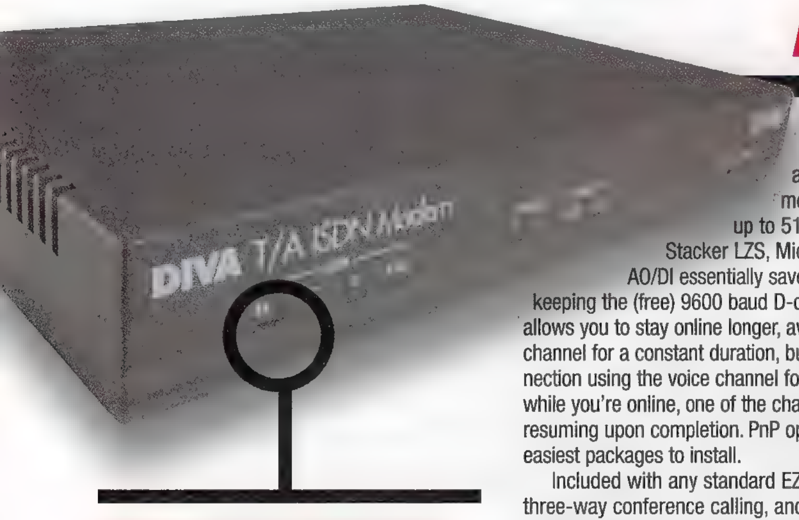
For more detailed information, white papers, and charts, point your browser to ***www.k56flex.com*** *or* ***x2.usr.com****.*

product info

Price $279
Company Boca Research
Phone 561.997.6227
URL www.bocaresearch.com

NOTICE THAT THERE IS ONLY A SINGLE TELEPHONE LINE-IN AND NOT DUAL JACKS, AS ONE MIGHT EXPECT.

Eicon DIVA T/A ISDN



Eicon Technology's DIVA T/A ISDN modem is the first of its kind to support Auto-SPID and Auto-Switch detection for simpler installation, as well as AO/DI (Always On/Dynamic ISDN) to reduce online tariff charges. The modem has a throughput of 128Kbps when bonding both B-channels and up to 512Kbps using onboard RFC Compression Control Protocol with Hi/Fn Stacker LZS, Microsoft MPPC, and Ascend compression.

AO/DI essentially saves mucho dinero by automatically toggling the B-channels as needed, while keeping the (free) 9600 baud D-channel active, via user-configurable thresholds. This bandwidth-on-demand allows you to stay online longer, avoiding the per-minute charges, as most users are not utilizing the full channel for a constant duration, but rather "bursting" data in chunks. Data Over Voice allows a 56Kbps connection using the voice channel for toll-free Internet access where ISPs support it. Should a voice call come in while you're online, one of the channels will suspend, allowing the call to go through and automatically resuming upon completion. PnP operation, as well as flash memory firmware upgrades, make this one of the easiest packages to install.

Included with any standard EZ-ISDN 1 package is caller ID, three-way conference calling, and call transfer, easily making ISDN cheaper than purchasing two analog phone lines. A toll-free number has been set up to aid ordering, thereby detangling the confusion many consumers face when dealing with their local phone company, covering everything from ordering the line and scheduling the installation to finding an ISP.

USING AO/DI AND THRESHOLDS, THE DIVA T/A PROBABLY WON'T HAVE BOTH B-CHANNELS PEGGED.

product info

Price $249
Company Eicon Technolgies
Phone 800.803.4266
URL www.eicon.com

COMPUTERS

SERIES 5–incl. PC Link

Value Offer-$50 rebate on S5 until 6/30/98

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Psion S3c-2Mb	$299
Psion S3c-1Mb	$249
SIENA	
Siena 1Mb	$199

PSION MODEMS

Universal Travel Modem	$129
PC Card Modem Adapter (req. PC Card Modem)	$139.99
PC Card Modems 33.6 to 56k	call

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Infrared Printer Adapter	$149

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NWT Memory Card- 8Mb (S5)	$159
Psion Memory Disk- 10Mb (S5)	$199
NWT Memory Card- 15Mb (S5)	$249
NWT Memory Card- 30Mb (S5)	$479
1Mb S3 Flash Memory Disk	$120
2Mb S3 Flash Memory Disk	$170
4Mb S3 Flash Memory Disk	$289
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Mac Connect-S5	$99
PsiMac-S3 (software & cable)	$100
PsiWin-S3 (software & cable)	$79
Synchronizer for Siena	$39.99
CASES	
Alpana Bawa Pouch	$50
Zip & Flip Cases	$45
Psion Leather Glove	$39
Executive Slim Leather Wallet	$49
Zip & Card Case (PC card adapter)	$75
Zip & Fax Case (Universal Travel Modem)	$75
ACCESSORIES	
S5 AC Adapter	$29
S3 AC Adapter	$20
Psion Desk Stand	$35
Reference Guides	$39
Duo Pen (ink & stylus pen in one)	$18

SOFTWARE

SOFTWARE FOR S5	
Allegro Handwriting Recognition	$59
Chess-S5	$79
Backgammon-S5	$79
Enroute-S5 (Road Atlas)	$79
Dictionary-S5 German/French/English	$79
Expense Manager-S5	$79
Financial Calculator-S5	$79
Berlitz Phrase Book-S5	$69
Presentation Maker-S5	$79
Monopoly-S5	$79
5 Pack (games)	$69
Psion Games Arcade-S5	$49
Diary Companion-S5	$20
SOFTWARE FOR S3	
World Travel companion-S3	$54
PsiMail Internet-S3	$59.99
Dataview Pro (mail & labels)-S3	$59
Expense Tracker-S3	$50
Automap Road Atlas-S3	$95
ACT! (Symantec)-S3	$99
Berlitz Phrase Book-S3	$95
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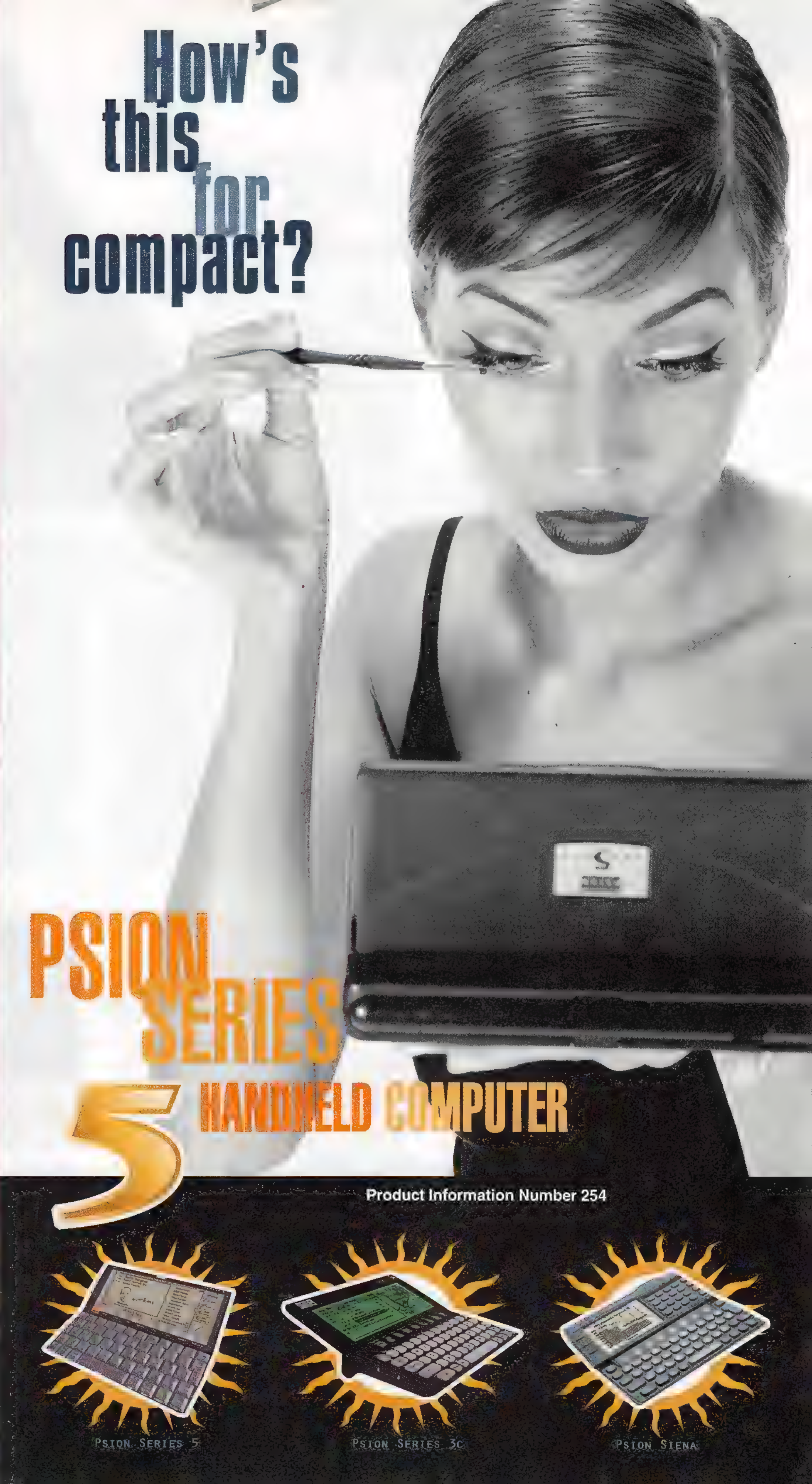
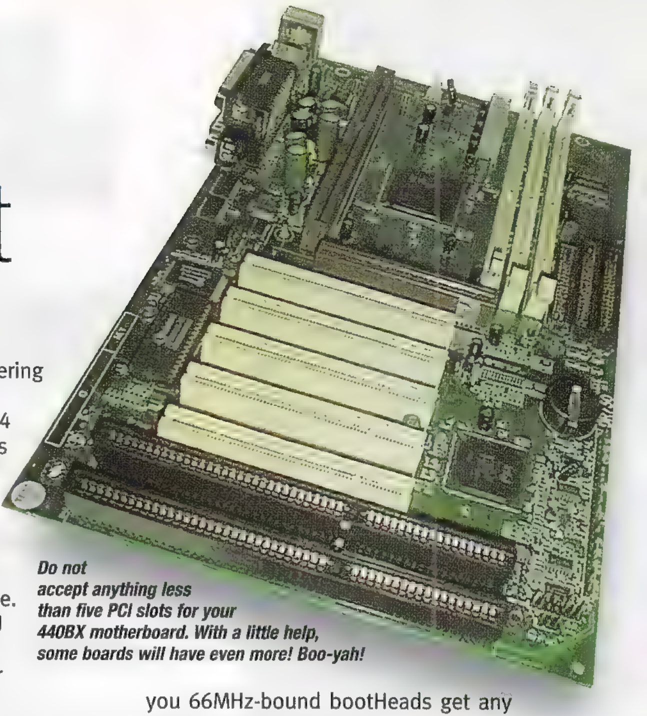


Product Information Number 254

Intel **440BX** AGPset

Breaking The 66MHz Speed Limit

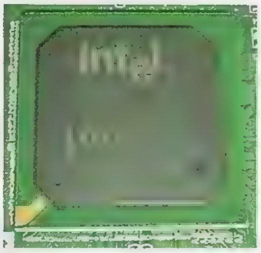


Do not accept anything less than five PCI slots for your 440BX motherboard. With a little help, some boards will have even more! Boo-yah!

1998 will be the Year Of Deschutes, at least, according to Intel. Bumping processor speeds up to 450MHz and slapping in larger L2 caches, Intel is breaking barriers all over the place, and the 440BX core-logic AGPset tears down one of the last bastions of Intel-specific bottlenecks.

With the 440BX AGPset comes that much-anticipated 100MHz system bus—the one major bottleneck that plagued the older 440LX. For those who missed our massive Deschutes blowout last month, here's a rundown of the 440BX's specifications.

Supporting either single- or dual-66MHz-system-bus-based Slot 1 Pentium II processors (233MHz through 333MHz) or 100MHz-system-bus Slot 1 or Slot 2 CPUs (350MHz, 400MHz, and conceivably 450MHz), the 440BX handles up to 1GB of system memory—all of it cachable. Unless you plan on staying with a 66MHz system-bus CPU (where EDO works best), you should opt for 100MHz SDRAM for maximum performance.



The 440BX core-logic chip, an engineering sample, was marked to ward off curious benchmarkers—like bootBoyz.

USB, PCI Level 2.1 bus-mastering compliance, Ultra DMA/ATA-33 device support, and PIO mode 4 ensures all your favorite devices are taken care of. A wealth of power-saving features also comes packed in the 440BX, following strict ACPI and OS Directed Power Management as well as EPA Mod 2.0 compliance. You can now keep track of CPU temperature, core voltage, and more, with a little Win95 helper app floating in the background.

There will be two flavors of 440BX shipping: The first wave of AGPsets will be coupled with an enhanced PIIX4E Southbridge chip. Later this year the PIIX6 Southbridge chip will be matched with the 440BX to grant you with IEEE 1394 I/O ports and up to four USB ports.

Judging from the performance results, we can safety say that the 100MHz system bus does make a pretty hefty impact on performance—for the better. With a P-II 300MHz CPU and a P-II 350MHz engineering sample, we proceeded to go mad with benchmarking flava. But before you 66MHz-bound bootHeads get any sexy ideas about plopping in your current CPU and overclocking it to 100MHz, you'd better check yourself lest you wreck yourself. With this particular motherboard's soft-jumper system, the BIOS automatically senses what type of CPU you have and gives you the appropriate CPU speed settings. Trust us—we tried. It remains to be seen whether jumper/DIP switch-based boards will offer the same roadblocks, but unless some mainboard makers get a little crazy with bus speed settings, expect the dichotomous choices of 66MHz or 100MHz with any board you see.

The 350MHz CPU easily overclocked to 400MHz and it coughed up even faster scores without breaking a sweat. The CPU

DirectX **6**

Say hello to two new APIs and a revised Direct3D

boot's Saint Alex St. John poses with Kevin Bachus, the Product Manager of DirectX from Microsoft. Alex got his head shaved for his birthday, which is on the first day of Meltdown. Coincidence... we think not.

Recently, Microsoft had a happy little DirectX 6 coming out party at Meltdown 98, revealing plans for two new APIs, DirectMusic, and DirectShow, along with reinforcement plans for Direct3D.

But the most significant (and possibly smartest) thing announced was that Microsoft will build DirectX completely into NT 5. There's no release date set for the new version of NT, but DirectX 6 is slated for Q4 1998. Microsoft also announced that if DirectX 6 was not ready in time for Windows 98, a service pack would include it, along with support for Windows 95.

DirectMusic was created to deal with the shortcomings of existing audio technologies. The offending technologies include: MIDI, which tops out at 127 instruments and plays back inconsistently; redbook audio, which can't synchronize with video and needs to be premixed and recorded; and digital audio, which is a resource hog and also needs to be premixed. digital audio, in fact, needs to be copied to the hard drive for adequate playback, making for gigantic game installations.

DirectMusic overcomes all these hurdles by offering developers two key benefits: a software synthesizer that consistently plays back on all systems, and DLS support that allows for custom instruments and triggered sound effects through MIDI. DirectMusic also allows for an unlimited number of instruments and effects, as well as a master clock that ensures music-video synchronization is exact. But DirectMusic's most powerful feature is its ability to compose music in realtime. Imagine redbook audio tracks that segue seamlessly according to specific game events. High-quality audio would provide key transitions in mood, tempo, and intensity with minimal CPU overhead.

DirectShow replaces ActiveMovie. The new API is object-oriented and will support all older content, replacing technologies such as the 16-bit Media Control Interface (MCI), which lacks support for new technologies such as DVD and Digital Broadcast Satellite (DBS). Expect better movies from games that use DirectShow.

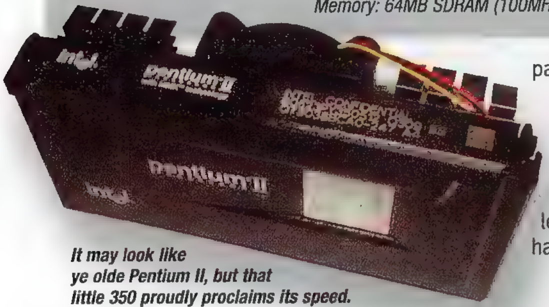
Benchmarking Results

CPU/System Bus Speed	P-II 300/66	P-II 350/100	P-II 400/100
bootMark	143	168	**192**
Final Reality AGP Test			
20MB textures	112.03fps	130.4fps	**145.31fps**
16MB textures	122.34fps	143.07fps	**161.33fps**
ForsakenMark (640x480)	52.18fps	56.24fps	**56.46fps**
DOS Quake (640x480)	31.8fps	38.0fps	**42.7fps**
MDK PerfTest v1.4	117	141	**163**
Memory Speed (MB/sec)	111.1	140.8	**159.5**
L2 Cache Speed (MB/sec)	314.5	326.7	**373.4**

Bold indicates better performance

Note: These results were taken from a production sample and are here to give examples of possible performance increases. Expect optimizations to occur before final product is released.

System Configuration: *CPU: Intel P-II 300MHz and Intel P-II 350MHz; O/S: Windows 95 OSR 2.1 Build 1212b; Video Card: Real3D Starfighter AGP (8MB); Memory: 64MB SDRAM (100MHz)*



It may look like ye olde Pentium II, but that little 350 proudly proclaims its speed.

runs cool under all circumstances (thanks in large part to the smaller .25-micron fab). Under the proverbial floating-point-pushing, unaccelerated *Quake*, the 400MHz CPU pumped an awesome 10fps faster than the 300MHz part, while the integer-intensive bootMark showed equally impressive increases. But the big performance boost, as expected, comes in AGP performance and memory speed. While the 300MHz part was able to come up with 111MB/sec data transfer rates, the 350MHz and 400MHz pushed at least 40MB/sec faster memory throughput, with the 400MHZ pushing close to 160MB/sec. AGP performance is equally enhanced, with speed increases bumping up 33fps past the 66MHz-bound 300MHz part.

As more and more 440BX boards become available, you can bet that we'll be there, benchmarking away and givin' you the skinny on what rocks and what sucks. At last, at least for Intel, the 66MHz bottleneck has been banished forever.

—Andrew Sanchez

product info

Available **Q2 1998**
Price **TBA**
Company **Intel**
Phone **800.628.8686**
URL **www.intel.com**

DirectShow (which will be built into *Internet Explorer*) also supports digital audio/video capture and playback, video editing, DVD playback, and a streaming API. DVD playback includes support for MPEG-2, AC-3 audio, UDF file system, and a copyright protection scheme. This gives developers the tools to create games based on DVD content. We're also talking DVD movie/game hybrids that use scenes from the movies for game backgrounds and textures—without a hit to the CPU.

Direct3D may not be a new API, but most developers believe it needs a facelift. Improvements include a new reference rasterizer that should enhance performance and make it easier to introduce new 3D features that will inevitably crop up in new hardware. There is also new support for multitexturing (no more repetitive wall textures!), stencil planes, vertex buffers, and new texture compression (provided by S3). An optimized geometry pipeline should further enhance performance. Finally, bump-mapping support is included, offering developers the ability to add depth to objects. This means an end to inappropriately smooth surfaces (hey, if it's a rocky wall, it should have rocks jutting out).

Microsoft also hinted at the future Fahrenheit API. A collaborative effort from Microsoft, Silicon Graphics, Hewlett-Packard, and Intel, it wraps OpenGL into DirectX. It appears to be targeted at the high-end workstation arena for CAD, 3D modeling, and rendering software. If you're expecting Microsoft to replace Direct3D with OpenGL, don't hold your breath.

—Sean Cleveland

product info

Available **Q4 1998**
Price **TBA**
Company **Microsoft**
Phone **425.635.7000**
URL **www.microsoft.com/directx**

HARDWARE ON THE HORIZON AND **SOFTWARE** SOON TO SHIP

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DirectX 6 60
Cirrus Logic MediaMa[illegible] 62
The 10th Planet 64

The boot *Tracking Sheet*

TITLE	DEVELOPER	DATE
Via Apollo MVP3 AGPset	***VIA***	***Apr-98***
AMD K6 300MHz	***AMD***	***Apr-98***
Half-Life	*Sierra Online*	*Apr-98*
Battlezone	*Activision*	*Apr-98*
Falcon 4.0	*Microprose*	*Apr-98*
Red Line Racer	*Criterion/Ubi Soft*	*Apr-98*
Trespasser	*DreamWorks*	*Apr-98*
Baseball 3D	*Microsoft*	*Apr-98*
The Dark Project	*Looking Glass Technologies*	*Apr-98*
Anarchy	*Microsoft*	*Apr-98*
F22 Total Air War	*DID/Ocean Intl*	*Apr-98*
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
440BX AGPset	***Intel***	***Q2/98***
K6 3D	***AMD***	***Q2/98***
5591 Socket 7 AGPset	***SiS***	***Q2/98***
Requiem	*3DO/Cyclone Studios*	*Q2/98*
[illegible]	[illegible]/*Red Orb*	*Q2/98*
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[illegible]	[illegible]	[illegible]
MechCommander	*Microprose*	*Q2/98*
[illegible]	[illegible]	[illegible]
Riot	*Microsoft*	*Q2/98*
Grim Fandango	*LucasArts*	*Q2/98*
[illegible]	[illegible]	[illegible]
Descent: Free Space	[illegible]	[illegible]
Cayenne 266Mhz	***Cyrix***	***Q3/98***
Pentium II/Slot 2	***Intel***	***Q3/98***
440NX AGPset	***Intel***	***Q3/98***
440LX-R AGPset	***Intel***	***Q3/98***
440NX [illegible]	***Intel***	***Q3/98***
Pentium II 0K cache	***Intel***	***Q3/98***
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[illegible]	*Microsoft*	[illegible]
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Prey	*3D Realms*	*Q4/98*
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[illegible]	[illegible]	[illegible]
[illegible]	*Microsoft*	[illegible]
K6+3D	***AMD***	***Q4/98***
[illegible]	***Intel***	***Q4/98***

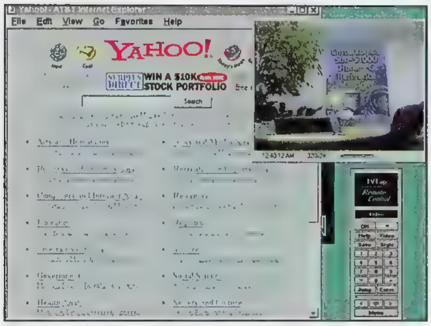
*These dates are subject to change
**Bold indicates hardware

Cirrus Logic **MediaMax**

A PC with a twist

A couple of years ago, devices combining PCs with traditional TVs were touted as the "next big thing." Companies big (Gateway 2000, Compaq) and small (WebTV, NetPC) jumped on the bandwagon, only to find the market untested, untried, and for the most part very immature. If the problem wasn't cost (Gateway's Destination was $5,000+), it was lousy execution (WebTV just plain sucked). Enter Cirrus Logic. By combining its resources and experience in silicon, sound, motherboards, and system integration, the company hopes to legitimize both the low-cost PC and convergence markets with its latest, the MediaMax.

First of all, MediaMax is a reference design only, so before you hit your local superstore, don't. You won't find it. However, Cirrus Logic is courting various OEMs (none were announced at press time) and assures us products based on this design will be available this summer, from both PC and personal-electronics manufacturers. Given that the average DVD-player costs around $600 to $700 these days, the MediaMax is an intriguing blend of traditional PC and home-entertainment components.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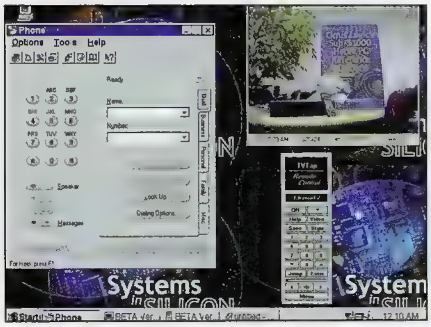
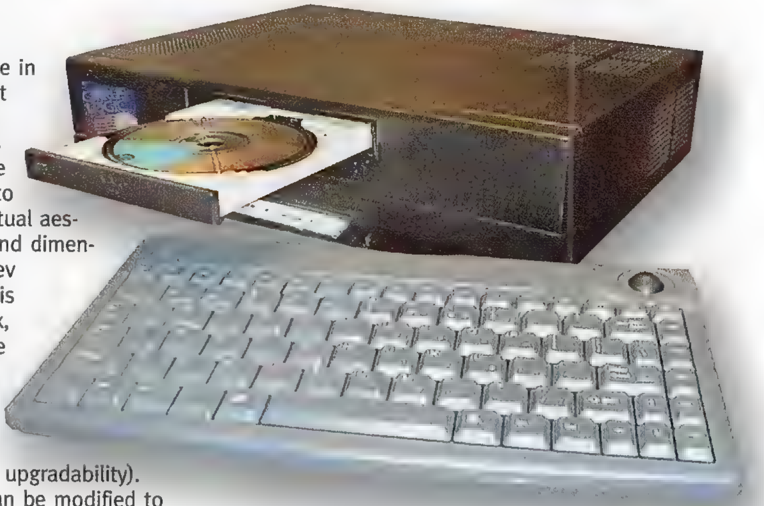
Search
TVTap Remote Control

The software show, in this case a virtual remote, is only for demonstration purposes.



It'll be up to system OEMs to develop unique and proprietary interfaces and controls.



As expected, the MediaMax will include an IR keyboard. A remote, à la Gateway's Destination, is also a possibility.

As you can see in this exclusive first look, the current design resembles a VCR, but it'll be up to the OEMs to determine the actual aesthetics, design, and dimensions. This first-rev reference design is also a closed box, meaning you'll be restricted from poking around inside (but OEMs can elect for some level of upgradability). The entire unit can be modified to resemble a desktop PC, and the proprietary motherboard can be swapped out for a more traditional NLX or ATX formfactor.

Considering the system's price, the guts are impressive. The box we saw housed an AMD 166MHz processor, but Cirrus Logic expects the speeds to be bumped up to 233MHz and maybe 266MHz by the time it actually starts shipping. Better yet, because the motherboard is Socket 7 compliant, there's no reason an OEM couldn't migrate to something even faster, such as AMD's enticing K6+3D. And although the current design houses only one 32MB DIMM, future designs will support two SIMMs for a total of 64MB.

The MediaMax is primed for Win98's Auto-On feature and will include a second-gen DVD-ROM drive along with hardware MPEG decoding. Cirrus Logic is integrating its own TV-tuner card—code-named Revolution—that will include various signal ins and outs, support for Macrovision copy protection and closed captioning, a five-tap filter for flicker-free processing. Maximum screen resolution will be 800x600. 2D and 3D video will be handled by an AGP-class Laguna 3D.

The rear panel is also chock-full of ports and plug-ins.

The front panel pops open to reveal integrated USB and Firewire ports.

Cirrus Logic emphasizes sound processing, so it has turned to its subsidiary, Crystal Semiconductor, for SoundFusion, a Dolby AC-3, Pro Logic, and Aureal-compatible PCI audio accelerator. It's a RAM-based DSP—the sounds are stored on your hard drive—and provides support for DLS 1.0, 3D virtualization, and HRTF-based 3D sound.

For communication, MediaMax will integrate an X2-compatible controllerless modem chipset, a speakerphone, and an infrared port. USB and IEEE 1394 ports are positioned on both the front and rear bezels, and although the model we saw didn't include one, a SuperDisk (LS120) drive can be integrated into the unit as well.

Again, this is only a reference design. Final models and features will vary by manufacturer.

—Bryan Del Rizzo

product info

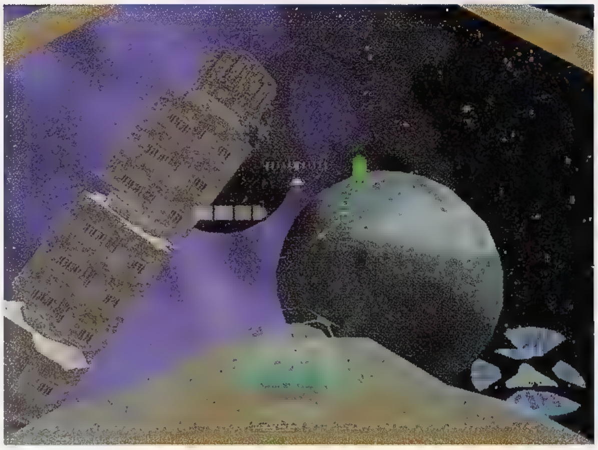
Available Summer 1998
Price Under $1,000
Developer Cirrus Logic (OEMs to be announced)
Phone 510.623.8300
URL www.cirrus.com

The **10th** Planet

War of the worlds

In a distant future, our solar system is a ravaged battlefield, and mighty starship armadas are the tools of our destruction. Using a previously unknown tenth planet orbiting our solar system as its staging ground, an invading alien force plans on conquering Earth and destroying anything that gets in its way.

Thus begins The 10th Planet, *Bethesda's epic space-combat saga that promises to take space combat to the next level. Lead designer* ***Bruce Nesmith*** *takes us deep into enemy territory to bring you this battle report.*

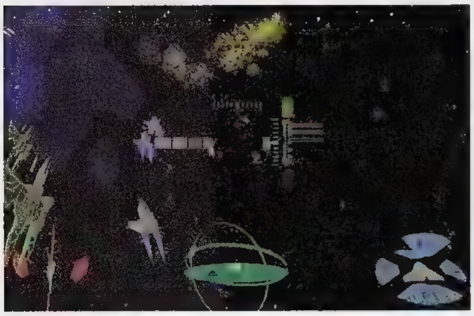


Behind the cockpit of your fighter, you'll have the run of the solar system in The 10th Planet.

***boot** What does Bethesda bring to space-combat that* **X-Wing** *or* **Wing Commander** *haven't already?*

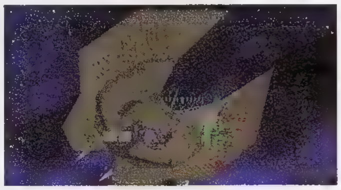
Nesmith *The 10th Planet* has three major elements to it: ship-to-ship dogfighting, the strategy game, and ship construction. The last two set us apart from other games.

The strategy game is the foundation for our ship combat missions. Every location in the solar system has an available mission. If you always choose easy missions or those that have little impact on the war, you will eventually lose. To win, you must choose your missions carefully.

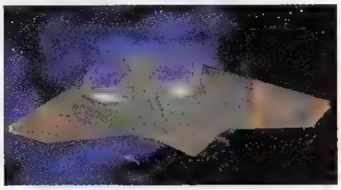


Even with this many ships on-screen, Bethesda promises you'll get no slowdown in frame rate.

With ship construction and customization, you can put over 100 pieces of equipment on your ship. Every game function must be tied to a piece of equipment. For example, you can turn your ship left only if you have a left thruster. When you build your ship, you make hard choices between engine power, maneuverability, weapons, defenses, and specialty equipment. You cannot have the best of everything. In combat, the equipment can be damaged.



It's not a Dralthi, but one of the many alien fighters you'll encounter.



Your fighter will be fully customizable—get ready to spend lotsa time tweakin' that ship.

***boot** Will* **The 10th Planet** *deal with individual fighter craft combat, or will we be able to command a massive capital ship?*

Nesmith The game is oriented to the fighter pilot in a one-man ship. However, you fight bigger ships, such as destroyers and huge motherships.

You can play with varying fleet sizes. You can be the squadron leader of up to six ships that fly in formation with you. You can order them to peel off and attack individual targets, or keep them with you. At the most, you might face two dozen alien ships.

***boot** You've said that your XnGINE 3D gaming engine would not use 3D hardware acceleration. Have you changed your view?*

Nesmith Our original statement is still true. However, we have an outstanding R&D department. They've written a new engine that uses the 3Dfx hardware, which we showed off at E3. *The 10th Planet* will ship with two versions: one for software only and one for use with 3Dfx hardware accelerators.

***boot** How has the XnGINE been optimized?*

Nesmith Every game we release has an improved version of the XnGINE. The big challenge for us with *The 10th Planet* was the scope of space. We will be able to display objects of any size, at any distance.

We can now support any video resolution, including mode X resolutions, so players can get an optimal frame rate for their machine.

We don't need OpenGL or Direct3D. They would just slow us down.

***boot** How many polygons will XnGINE push?*

Nesmith There is really no upper limit; it's really dependent on the machine specs. We've found that with higher-end computers, it takes a back seat to other issues. Even our smallest fighter has several hundred polygons. If we doubled that, it wouldn't make a dramatic difference to the frame rate.

***boot** Will we see any cool effects such as colored lighting, perspective correct shadows, and the like?*

Nesmith You'll see all of those. The cockpit glass will transparently reflect the stars. The engine glows will have colored lights. All HUD elements will be translucent. Explosions will be 3D alpha blends. In particular, our sunlight effect has gotten rave reviews. Enemies coming at you with the sun behind them are almost impossible to see.

***boot** Will there be multiplayer mayhem?*

Nesmith The strategy game itself would not work in multiplayer mode, but there will be both deathmatch and co-operative missions. The coolest thing about multiplayer is how it uses ship customization. Each player can customize his ship and save it separately. Then, you can fly in deathmatch or team vs. team play.

***boot** Any support for specialty controllers such as force-feedback?*

Nesmith We will support any I-force–compatible joystick. Since all the controls are user configurable, players will be able to set up just about any type of advanced joystick or throttle combination.

***boot** What's the AI like?*

Nesmith Ships fly in squadrons, so there are actually two levels of AI, one for individual ships and another for the squadron. The ships will be smart enough to do subtle things like executing a roll to present stronger shields to the player.

product info

Available *Q2 1998*
Price *TBA*
Developer *Bethesda Softworks*
Phone *800.677.0700*
URL *www.bethsoft.com*

REVIEWS

KICKIN' THE TIRES ON THE LATEST **HARDWARE** AND TAKIN' THE NEWEST **SOFTWARE** OUT FOR A SPIN

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Bad Wives 90
Riana Rouge 90

bootLab **Policy**

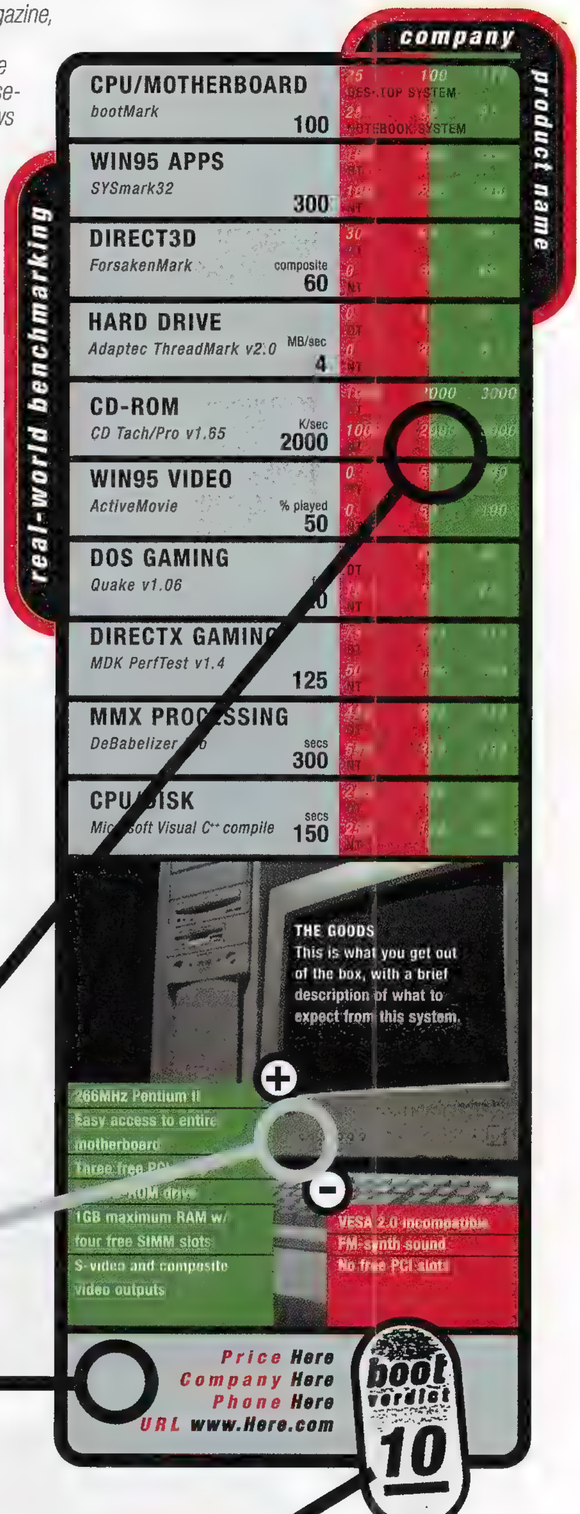
boot *isn't like any other computer magazine, and neither is our product-**evaluation** process. We don't test equipment in the cold, sterile environment of a warehouse-sized lab, and we don't write our reviews based on the **test scores** that labcoat-wearing technicians scribble on clipboards.*

*Our review **scores** are based on a combination of objective **benchmark** testing, real-world performance, and our subjective evaluation of features, performance, and the many less tangible **characteristics** that go into a product. All our evaluations are based on **hands-on** use of the product.*

3D Benchmarks

Final Reality and X

We've added two new tests to our 3D benchmarking bag of tricks. X is an upcoming Direct3D space-combat and trading game from EgoSoft. The demo runs through a scripted series of scenes and reports an average frame rate. Final Reality, *a comprehensive 2D/3D benchmark developed by VNU European Labs, is based around a game engine from Remedy Entertainment's upcoming* Max Payne. *It tests several fly-through scenes, as well as some abstract performance tests. Look for both new tests on the bootDisc.*



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product name
real-world benchmarking
CPU/MOTHERBOARD
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DESKTOP SYSTEM
25
NOTEBOOK SYSTEM
WIN95 APPS
SYSmark32
300
NT
DIRECT3D
ForsakenMark
composite
60
30
0
NT
HARD DRIVE
Adaptec ThreadMark v2.0
MB/sec
4
DT
0
NT
CD-ROM
CD Tach/Pro v1.65
K/sec
2000
2000 3000
100
WIN95 VIDEO
ActiveMovie
% played
50
0
100
DOS GAMING
Quake v1.06
DT
NT
DIRECTX GAMING
MDK PerfTest v1.4
125
50
NT
MMX PROCESSING
DeBabelizer Pro
secs
300
NT
CPU/DISK
Microsoft Visual C++ compile
secs
150
25
NT
+
266MHz Pentium II
Easy access to entire motherboard
Three free PCI
ROM drive
1GB maximum RAM w/ four free SIMM slots
S-video and composite video outputs
−
VESA 2.0 incompatible
FM-synth sound
No free PCI slots
Price Here
Company Here
Phone Here
URL www.Here.com
boot verdict
10

THE GOODS
This is what you get out of the box, with a brief description of what to expect from this system.

REAL-WORLD BENCHMARKING

The new meter has the precise scores for each category benchmarked. Plus, the color bars to the right give you a quick idea of how well the system performed in that category.

It's simple: The farther right the bar reaches, the better the system scored. Green means the system performed on par or beyond what we expect of a current system. If you see nothing but red, the system performed below expectations.

PLUSES AND MINUSES

Here's where we list the best and worst a system has to offer.

CONTACTS

Look here for price and the company's phone number and URL if you want more information.

BOOT VERDICT

The one that really matters. This score reflects how we feel about a system, taking into account the benchmark results, quality of parts, usability, overall performance, and our intense, under-the-hood scrutiny.

boot KICK ASS! PRODUCT

Only the **best** earn enough respect to be worthy of our **editors'-choice** award.

Real3D Starfighter AGP

The new kid's in town

boot KICK ASS! PRODUCT

Real3D's StarFighter AGP card—the love child of Intel, Lockheed-Martin's Real3D, and Chips and Technology—rocks.

Intel's 2D/3D i740 (previewed in *boot* 19) powers this StarFighter. With the 3D processor running at 66MHz, the i740's 64-bit split-memory architecture design is coupled with 8MB of 100MHz SGRAM and a 220MHz RAMDAC. And, as a full AGP-2x-with-sidebands-compliant part, all those juicy 15MB+ textures are ready to jump from system memory directly into the i740 for texel processing. The board is cleanly laid out, with a white mini-connector sitting next to the heatsink-laden i740 for an optional DVD daughtercard. Sadly, the version reviewed doesn't come with TV inputs or outputs.

OpenGL Quake-o-rama

GLQuake	(512x384)	47.1fps
	(640x480)	37.6fps
GLQuake II	(512x384)	27.0fps
	(640x480)	24.9fps
	(800x600)	20.1fps
	(1024x768)	12.8fps

- *GL mini driver version beta 1.2.4.0119.*
- *DEM files used: GLQuake=bootmark.dem; GLQuake II=demo2.dm2*

The AGP Texture Push

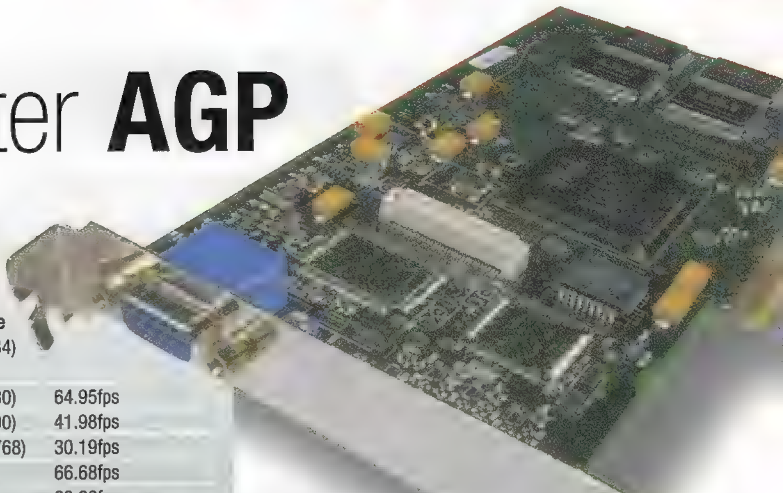
Final Reality	
20.3MB	118.91fps
16MB	123.76fps
12.3MB	136.84fps

How does it perform? Pretty damned hot. DOS performance is fast. With a little help from VESA 2.0 support built into the flashable video BIOS, the StarFighter posted a cool 30fps in 640x480 *Quake*. Considering Chips and Technology's major tech knowledge comes from the laptop world, the i740's DirectDraw performance is also top notch, meeting Riva 128 or V2200 performance in our MDK PerfTest and *Final Reality* DirectDraw tests.

But pump some texture-mapped polygons its way, and the Starfighter works them like there's no tomorrow. Before all you Voodoo 2 heads get bent out of shape, let's get one thing clear: the StarFighter will not do 100fps in *Quake II*. What it does give you is superb visuals, and it backs up all that prettiness with ample performance. Attention to visual quality was one of Intel's prime goals with i740, and it's succeeded—and then some. With its combination of per-pixel mip-mapping and support for almost every 3D feature set, including trilinear filtering and edge anti-aliasing, the StarFighter clocked in a steady 60fps+ at 640x480 in all our Direct3D tests. From *Turok* to ForsakenMark, those pixels flew. The StarFighter does take a performance hit when bumping up the resolution, although 40-odd fps isn't anything to scoff at. Under *Jedi Knight*, transparencies showed up clear as crystal, while frame rates wandered from 60fps at 640x480. We can't stress enough just how gorgeous D3D titles appear with the StarFighter—blended, colored lighting and excellent alpha-blending abound in *Forsaken*, exhibiting zero errors. Hell, the StarFighter posted crazy-sexy-cool frame rates under the *Final Reality* AGP tests—even with 20MB of texture.

The Direct3D Gauntlet

Direct3D Performance	
ForsakenMark (512x684)	57.46fps
ForsakenMark (640x480)	64.95fps
ForsakenMark (800x600)	41.98fps
ForsakenMark (1024x768)	30.19fps
X (640x480)	66.68fps
X (800x600)	60.26fps
X (1024x768)	45.08fps
Turok (512x384)	74.4fps
Turok (640x480)	68.4fps
Turok (800x600)	34.2fps
Final Reality 25Pixel	22.31Kpolys/s
Final Reality Fill Rate	207.49Mpixels/s



Here it is, in all its 8MB goodness. Real3D's StarFighter is one kick-ass video card capable of pumping AGP textures across at 2x speeds with side-bands. The Rage Pro ain't the only 2x AGP part in town no more.

At the time of testing, the StarFighter's Win95 ICDs were not ready for prime time. So, Real3D had us use its very own D3D-to-GL wrapper for our *Quake* testing. Performance should suck with this hack in place, right? Wrong. Even with this OPEN32.DLL file in place, the StarFighter easily outgunned Hercules' 8MB Thriller 3D by posting a cool 37fps in 640x480 *GLQuake*—faster than the high teens/low twenties Voodoo Rush boards give. A full-featured ICD for Win95 and MCD for NT4 should be ready by the time you read this, something ATI has yet to accomplish with its Rage Pro.

Real3D Starfighter AGP

Forsaken/D3D

Visual Quality

MPEG-1 playback is best served at 640x480/16-bit. You can crank as high as 1024x768, but anything higher results in chop-o-rama frame rates and blocky edges.

ATI's no longer the only AGP 2x pony in town, and Real3D's level of visual excellence and performance—honed in the arcades—shines through in the StarFighter. Look out world, i740's here.

—*Andrew Sanchez*

Feature Set and 2D Performance

Max 24-bit resolution/refresh	1280x1024/85Hz
Max 16-bit resolution/refresh	1280x1024/85Hz
DOS Quake (640x480)	31.3fps
DOS Quake (800x600)	22.4fps
MDK PerfTest v1.4 (DirectDraw)	127
Final Reality Radial Blur (DirectDraw)	29.84fps
Final Reality Chaos Zoomer (DirectDraw)	40.82fps

Test system: ***Micron Millennia*** *XRU; CPU: Intel Pentium II 300MHz; O/S: Windows 95 OSR2.1 Build 1212b; Motherboard: Intel AN440 440LX AGPset (1 AGP, 2 PCI, 2 ISA, 1 PCI/ISA shared)*

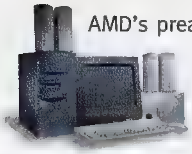
THE STATS: BIOS: 203-AGP v1.0 I Win95 Drivers: 3.2.0132(584) ***THE BUNDLE:*** Win95 Drivers I Real3D demos: WIRL I VRCreator I Kinesub I Incoming I Planet Tours I Town I Realimation SDK I NetImmerse I Bat Cave I Digital Bayou I Space City I 3Deep I Game Bundle TBD

Price $249 (8MB AGP)
Company Real3D
Phone 800.393.7730
URL www.real3d.com

boot verdict 9

Polywell **K6 266**Mx

Banishing Intel to processor purgatory



AMD's preaching the holy gospel of Socket 7, and its 1998 roadmap is proof of its zealous commitment to the Zero Insertion Force religion. Enter Polywell Computers, a worthy acolyte and follower of the build-to-order cult, with its latest K6-armed system.

The slate blue, medium ATX tower houses Polywell's own Poly 500TX6 motherboard. This system's only allegiance to Intel is in the core-logic chipset used—the 430TX PCIset. Otherwise, it's AMD-inside this bad-boy, but not just any K6. This system's blessed with AMD's 266MHz K6, their fastest to date. Hidden underneath a fan/heatsink combo, the CPU and the four SIMM and two DIMM sockets suffer from Freaky Friday syndrome, with the CPU located to the right of the 250-watt ATX power supply fan—ugh!

Pixel-pushing duties are relegated to the dynamic duo of Diamond's Voodoo-powered Monster 3D and a 4MB ViRGE/DX board wired to an ebony Sampo Alphascan 17-inch SVGA monitor. For tunes and tones, Polywell opts for a menage-a-deux as well, with a Crystal CS37W 16-bit ISA soundcard for DOS legacy support and Diamond's Monster Sound for much 3D sonic seduction. Adding to this mayhem is a gaggle of Yamaha speakers for full surround-sound effect: the System 45s take care of front satellites and subwoofer duties, while the YST-M15s work the rear. A Diamond Supra K56flex internal fax/voice/modem is on hand for high-speed surfing. Meanwhile, Maxtor's 85250D 5.1GB Ultra DMA IDE hard drive and Toshiba's 6102B 24x EIDE CD-ROM drive are in effect. And, if you wanna add more stuff, the one 3.5-inch and two 5.25-inch drive bays should keep you happy, as everything is easy to get to.

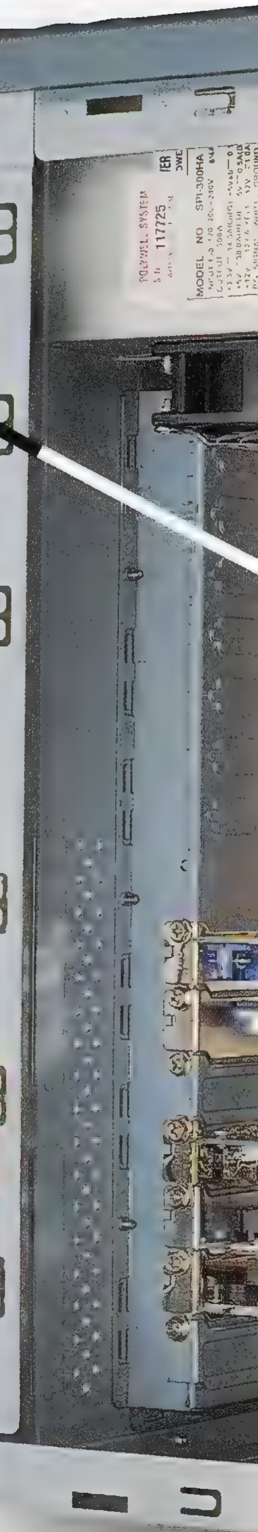
On the performance tip, this machine posts the fastest scores ever seen for a Socket 7 processor by posting a 99.8 on our bootMark. The closest score Intel ever mustered was in the mid 60s with its 233MHz Pentium part. The K6 may kick ass against any Socket 7 CPU, but it comes up short in comparison to a 266MHz Pentium II processor, which posts around mid-to-high 120s, depending on memory configuration. Regardless, the Polywell system posted excellent Visual C++ compile times, easily running neck-and-neck with many of the P-II 266MHz machines we've seen, as is the *DeBabilizer Pro*/MMX processing. Direct3D gaming is also sweet, with the K6/Voodoo combo coughing up 51fps under ForsakenMark. Hard drive and CD-ROM performance are middling, but acceptable. The *MDK* PerfTest score of 90 is low, but *Quake* tells the big floating-point story. As expected, the ViRGE/DX chip refused to do SVGA until we sicced *Display Doctor* on its ass, and even then, it hobbled along at 14.9fps—more the fault of the video card than the CPU, we reckon.

Purge the ViRGE and go with another 2D solution (nVidia, Matrox, ATI, and Number Nine come to mind), and swap out the Sampo Alphascan 17-incher for something with higher refresh rates to achieve visual nirvana. While the Crystal soundcard gives you legacy support, why a genuine Creative Labs part wasn't employed is odd.

Overall, the Polywell K6 266 Mx is a great starting point. If you excise those funky parts, you'll be well on your way to AMD nirvana.

—Andrew Sanchez

FREAKY FRIDAY
Gadzooks! Whoever designed this motherboard should be burned at the stake! What were they thinking placing the CPU away from the ATX power-supply fan?



under the hood

THE BRAINS

CPU	AMD K6 266MHz
L2 Cache	512K pipeline-burst external (nonupgradable)
RAM	64MB SDRAM (256MB max)
MOTHERBOARD:	Poly 500TX6 ATX (430TX)

THE BRAWN

Video	S3 ViRGE/DX with 4MB, Diamond Monster 3D (3Dfx Voodoo)
Hard Drive	Maxtor 85250D 5.1GB Ultra DMA IDE
CD-ROM	Toshiba 6102B 24x EIDE
Expansion	Three PCI, three ISA, one shared ISA/PCI
Fax/modem	Diamond Supra K56flex fax/voice/modem (K56flex compatible)
I/O Ports	Two USB, two serial, one parallel, two game/MIDI (one active)

THE BEAUTY

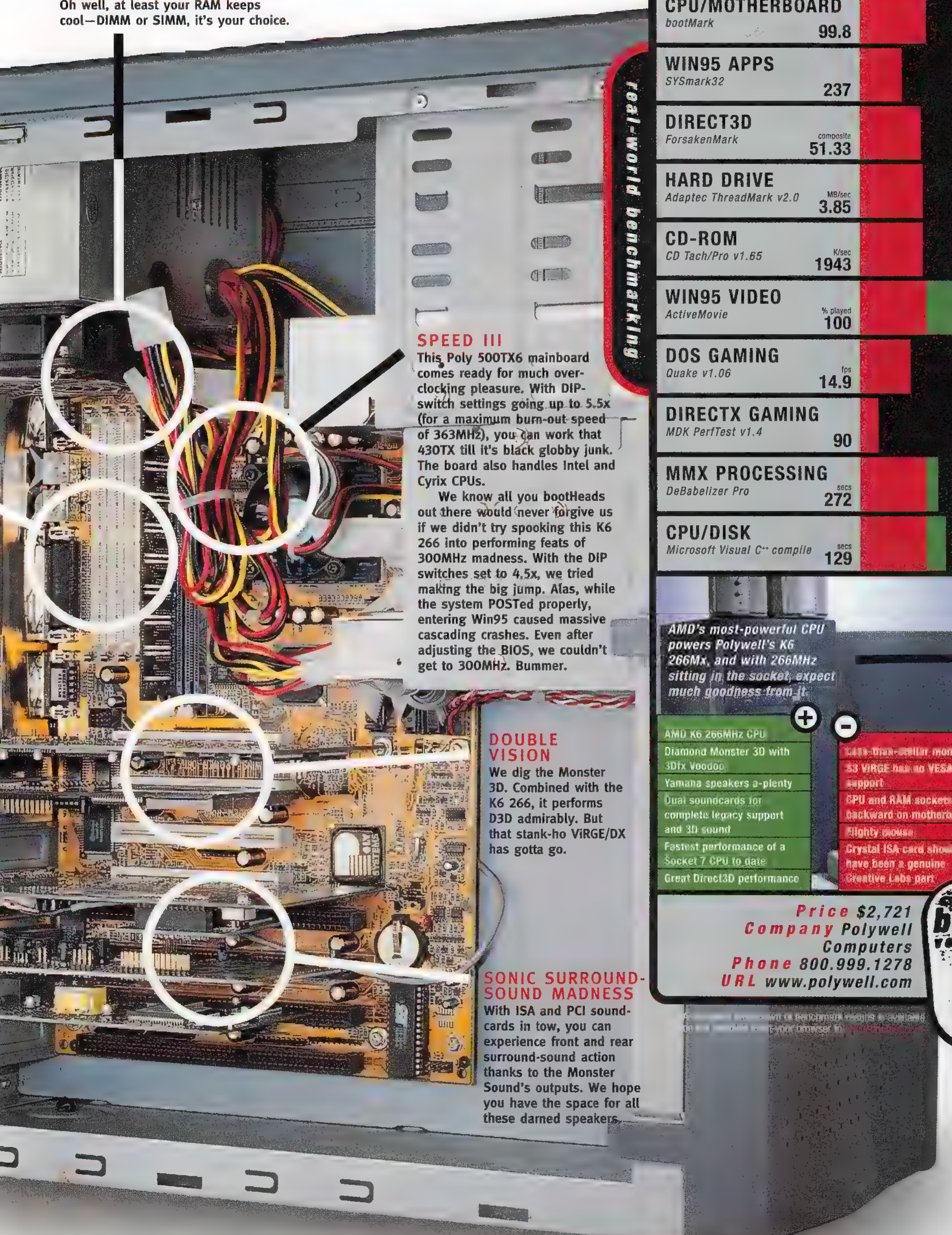
Display	Sampo Alphascan 17-inch monitor, 0.28mm dot-pitch,
Sound	Crystal CS37W-3DIS/C 16-bit ISA card, Diamond Monster Sound PCI
Speakers	Yamaha System 45 (two YST-M15 satellites and YST-MSW10 subwoofer)
Other	Genius NetMouse

EXPANSION MAP

PCI	Video Card
PCI	Video Card
PCI	Free
PCI/ISA	Sound card (PCI occupied)
ISA	Soundcard
ISA	Free
ISA	Modem

THE BUNDLE Windows 95 OSR2 | Necessary device drivers for hardware

boot	*down*
1:02	:03



KEEPING THE SOCKETS CHILLED—FOR WHAT?

Oh well, at least your RAM keeps cool—DIMM or SIMM, it's your choice.

SPEED III

This Poly 500TX6 mainboard comes ready for much overclocking pleasure. With DIP-switch settings going up to 5.5x (for a maximum burn-out speed of 363MHz), you can work that 430TX till it's black globby junk. The board also handles Intel and Cyrix CPUs.

We know all you bootHeads out there would never forgive us if we didn't try spooking this K6 266 into performing feats of 300MHz madness. With the DIP switches set to 4.5x, we tried making the big jump. Alas, while the system POSTed properly, entering Win95 caused massive cascading crashes. Even after adjusting the BIOS, we couldn't get to 300MHz. Bummer.

DOUBLE VISION

We dig the Monster 3D. Combined with the K6 266, it performs D3D admirably. But that stank-ho ViRGE/DX has gotta go.

SONIC SURROUND-SOUND MADNESS

With ISA and PCI soundcards in tow, you can experience front and rear surround-sound action thanks to the Monster Sound's outputs. We hope you have the space for all these darned speakers.

Polywell

K6 266Mx

real-world benchmarking

Test	Benchmark	Unit	Score
CPU/MOTHERBOARD	bootMark		99.8
WIN95 APPS	SYSmark32		237
DIRECT3D	ForsakenMark	composite	51.33
HARD DRIVE	Adaptec ThreadMark v2.0	MB/sec	3.85
CD-ROM	CD Tach/Pro v1.65	K/sec	1943
WIN95 VIDEO	ActiveMovie	% played	100
DOS GAMING	Quake v1.06	fps	14.9
DIRECTX GAMING	MDK PerfTest v1.4		90
MMX PROCESSING	DeBabelizer Pro	secs	272
CPU/DISK	Microsoft Visual C++ compile	secs	129

AMD's most-powerful CPU powers Polywell's K6 266Mx, and with 266MHz sitting in the socket, expect much goodness from it.

+	−
AMD K6 266MHz CPU	Less-than-stellar monitor
Diamond Monster 3D with 3Dfx Voodoo	S3 ViRGE has no VESA 2.0 support
Yamaha speakers a-plenty	CPU and RAM sockets backward on motherboard
Dual soundcards for complete legacy support and 3D sound	Flighty mouse
Fastest performance of a Socket 7 CPU to date	Crystal ISA card should have been a genuine Creative Labs part
Great Direct3D performance	

Price $2,721
Company Polywell Computers
Phone 800.999.1278
URL www.polywell.com

boot verdict 7

[illegible] benchmark results is available [illegible] browser to [illegible]

It's a **PCI** Soundcard **Party**

Living melodically on your 32-bit bus

Nothing brings the burliest CPU down like mixing multiple digital samples in realtime. Being bound to an ISA device that sits on a slow-as-a-slug bus and forcing your processor to sweat out the mixing details only make things worse.

With the advent of PCI soundcards and DirectSound, these bottlenecks are rendered mute. Used with a core-logic chipset that handles distributed DMA and bus-mastering PCI, many of these new cards claim almost 100% legacy SoundBlaster support over the PCI bus—something Creative Labs said couldn't happen. Also, by getting rid of expensive local ROM and putting all your MIDI samples in system memory, these new PCI cards are cheap. But make sure the chips are true 3D sound accelerators and aren't merely "compliant."

—Andrew Sanchez

Ensoniq **AudioPCI** S5016

Powered by Ensoniq's ES1370 Digital Audio and Music Controller, the AudioPCI S5016 uses either 2MB or 4MB wavetable soundsets (switchable via a Control Panel applet) and conforms to GMIDI standards. The synthesizer pumps up to 32 simultaneous voices, and all sorts of digital effects can be administered on those samples. Distributed DMA is not required with this board. The ES1370 is DirectX compliant, but not Aureal3D compliant, and because it has no integrated DSP, the majority of sound mixing and acceleration is still done by the CPU via the faster PCI bus.

The board's I/O panel houses a joystick port, as well as three 1/8-inch mini cables for stereo-out, mike-in, and line-in. Meanwhile, the three internal connectors are strictly for the CD-ROM drive.

The AudioPCI installed without a hitch, with three drivers taking residence under Win95. Legacy real-mod DOS SBPro and GMIDI support is handled by a TSR. DOS, Win3.1, and WinNT 4 are also supported.

Under our battery of tests, the AudioPCI S5016 kept up with the pack, sporting low CPU utilization under DirectSound and passing our DOS legacy support tests. All the digital joysticks worked fine. The sound quality of the AudioPCI S5016 is sharp and precise, with no distortion. The default 2MB of MIDI patches are surprisingly lush, with excellent strings and percussions, although the horns sound artificial. The biggest fault? The S5016 doesn't have a true DSP onboard. So while you'll enjoy the faster bus and memory access of PCI, don't expect any help from the ES1370 when a boatload of 44KHz samples hits this sound system.

It may not have all those cool sound APIs covered, but the AudioPCI's MIDI tones are sweet.

Still, as a SoundBlaster replacement, the AudioPCI is no joke, but it lives in a world where audio acceleration will play a bigger and bigger role; and there, it comes up short.

THE STATS: Signal/Noise Ratio: 90db | Frequency Response: 20Hz–22KHz
THE BUNDLE: Win95/NT4 Drivers

Price $79
Company Ensoniq
Phone 800.610.4847
URL www.ensoniq.com

boot verdict 6

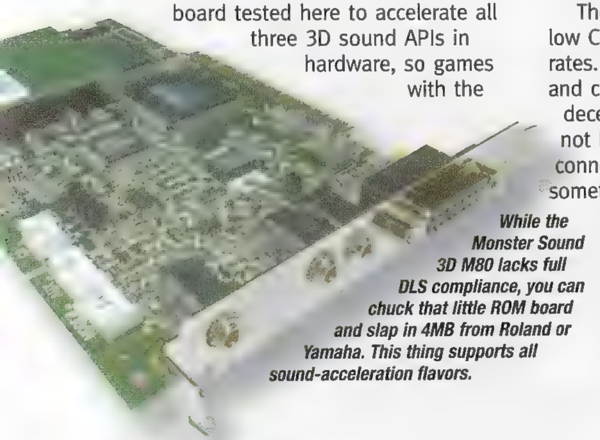
Diamond **Monster** Sound **M80**

Its sire was in *boot*'s Dream Machine 97, and this year Diamond's expanding on its Monster Sound line of PCI soundcards with the Monster Sound M80.

This card prefers an ISA board sitting alongside for 100% legacy compliance, with Analog Devices' 2181 (a 40MIPS DSP) forming the core. This ASIC is the only board tested here to accelerate all three 3D sound APIs in hardware, so games with the Aureal3D-compatible logo will fire positional sounds without taking a performance hit. Next to the CD-ROM input connectors sits an SB16-compliant header connector for waveblaster-style daughtercards (currently occupied by a 32-voice AdMos MIDI ROM). I/O duties are relegated to 1/8-inch stereo-in and out, mike-in, and a 15-pin joystick port.

Diamond provides a massive Monster Cable 1/8-inch mini cable for hook-up with your existing ISA solution.

The M80 performed as expected, sporting low CPU utilization and keeping up frame rates. Digital samples came through loud and clear, while the AdMos chimed in some decent MIDI tunage. While the system is not DLS compliant, the WaveBlaster header connector lets you swap out that board with something sexier. But don't expect any real-mode DOS support, as the M80 failed both tests.



While the Monster Sound 3D M80 lacks full DLS compliance, you can chuck that little ROM board and slap in 4MB from Roland or Yamaha. This thing supports all sound-acceleration flavors.

With the shipping joystick drivers, the M80 can identify only the Microsoft Force Feedback stick and not the two Thrustmasters. Diamond recommends you get the latest joystick driver from Microsoft. Also, DLS fanatics are left hanging.

Make no mistake—the Monster Sound M80 is not meant as a SoundBlaster replacement. Rather, it's designed to give folks with DirectSound3D or Aureal3D-compatible games a chance to immerse their aural desires without sacrificing SB legacy support.

THE STATS: Signal/Noise Ratio: 90db | Frequency Response: 20Hz–20KHz
THE BUNDLE: Win95 Drivers | Jedi Knight: Pathway to the Force | Wave Editor | Midisoft Studio Recording Session | Microsoft NetShow | Internet Explorer | Intervista WorldView 2.0 | Midisoft Internet Sound Bar

Price $100
Company Diamond Multimedia
Phone 800.468.5846
URL www.diamondmm.com

boot verdict 7

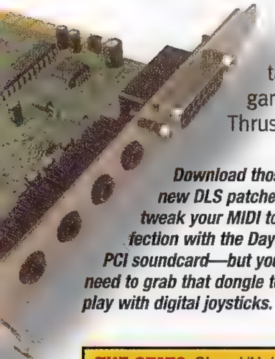
Turtle Beach **Daytona PCI**

The only board of the bunch with full DLS support, Turtle Beach's Daytona PCI sports S3's SonicVibes under the hood, so you know it sounds sweet. Via the DLS (only available in Win95), the Daytona PCI locks in up to 10MB of system memory for high-quality, 32-voice MIDI, while the 16-bit delta sigma ADC/DAC promises crisp digital sample playback. This board *requires* a chipset that supports distributed DMA.

While the Daytona PCI can handle DirectSound fine, it's not a DirectSound3D or Aureal3D accelerator, although it does come with SRS surround-sound enhancements. While internal header connectors are relegated to CD-ROM inputs, I/O ports consist of a 15-pin joystick/MIDI interface and four 1/8-inch mini connectors. Apart from the SonicVibes chip and one PROM chip, the board is barren.

Installation was a snap, with the DLS manager setting up house inside the Control Panel. Resources for legacy support are as expected (one DMA, IRQ, and some I/O address). While the SonicVibes supports full real-mode DOS support via TSR, Turtle Beach opts for DOS-in-a-window support only. Turtle Beach recommends you sit the Daytona PCI alongside your current ISA solution if you want 100% compatibility.

The Daytona PCI gives some silky-smooth MIDI playback. The stock patches are a mixed bag, with strong percussion and strings, but artificial horns. And with frame rates and CPU utilization keeping stride, what stops the Daytona PCI from kicking ass and taking names? Digital game controllers. Thrustmaster's Millennium Inceptor 3D is the only stick it recognizes. Without that TSR, legacy DOS support was a dismal failure.



Download those new DLS patches and tweak your MIDI to perfection with the Daytona PCI soundcard—but you'll need to grab that dongle to play with digital joysticks.

THE STATS: Signal/Noise Ratio: N/A | Total Frequency Response: N/A ***THE BUNDLE:*** Win95/NT4 Drivers | Voyetra MIDI | Jam Grid Orchestrator Plus | AudioStation | DLS Manager | AudioView | MIDI Orchestrator | Music Games | Audio Calender | Say It!

Price ***$130***
Company ***Turtle Beach Systems***
Phone ***800.233.9377***
URL ***www.tbeach.com***

boot verdict 6

Dare to Compare

Test	**AudioPCI**	**SonicStorm**	**Monster Sound M80**	**Daytona PCI**
Digital Joystick Compliance				
Microsoft Force Feedback joystick	YES	YES	YES	NO *
Thrustmaster Millennium Inceptor 3D	YES	YES	NO	YES
Thrustmaster Rage3D	YES	YES	NO	NO *
% CPU Utilization via DirectSound				
Eight mixed signals **	3.94 - 4.12%	3.96 - 4.03%	3.94 - 4.04%	3.96 - 4.01%
Legacy Real-Mode DOS Support (PASS/FAIL)				
Dark Forces/iMuse sound engine	PASS	PASS	FAIL	FAIL
TerraNova/AIL by Miles Audio Designs	PASS	PASS	FAIL	FAIL
Win95 DirectSound Performance (fps)				
ForsakenMark (640x480)	44.17	44.2	44.7	44.2
GLQuake (640x480)	25.4	26.9	25.5	25.5
GLQuake2 (640x480)	18.8	18.5	18.7	18.8
Win95 Sound Feature Set				
DirectSound accelerator	NO	YES	YES	YES
DirectSound 3D accelerator	NO	YES	YES	NO
Aureal A3D compliant	NO	NO ***	YES	NO
Downloadable Sample Compliant	NO ****	NO ***	NO *****	YES
Adjustable sample RAM	YES	NO ***	NO *****	YES

** Microsoft makes a $12 dongle for its digital joysticks that allows use with Turtle Beach and a number of other cards.*
*** Under Qsound QMixer 95 v2.24, eight .WAV files of varying sampling rates and channels were played simultaneously through the DirectSound driver.*
**** Forthcoming drivers promise to implement features.*
***** While not DSL compliant, you can download bigger MIDI sample sets.*
****** No DLS or adjustable RAM, but does have WaveBlaster-compatible header connector.*
Test system: CPU: Intel Pentium II 233MHz, Motherboard: ASUStek P2L97 440LX, RAM: 64MB SDRAM, Video Card: Rendition V2200 AGP reference board with 4MB SGRAM, O/S: Windows 95 OSR2.1 Build 1212b with DirectX 5

VideoLogic **SonicStorm**

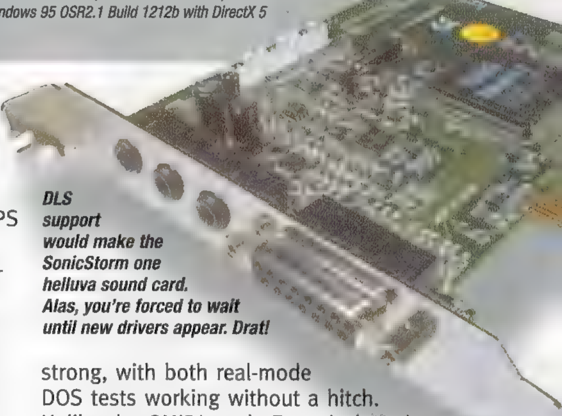
With a grand line of video cards under its belt, VideoLogic breaks into untried territory with its SonicStorm soundcard.

Powered by ESS's Maestro-1 (a 500MIPS DSP), the SonicStorm supports Qsound, DirectSound, and DirectSound3D acceleration, but not Aureal3D with the current driver. Also, these drivers lock in 2MB of system memory for wavetable samples. The ability to adjust memory usage (from 2MB to 4MB), full Microsoft DLS support, and Aureal3D emulation are promised via new drivers. I/O duties are handled by 1/8-inch stereo-in, line-out, mike-in, and 15-pin joystick/MIDI ports, but there is no internal header connector for WaveBlaster-compatible MIDI boards. Still, the SonicStorm supports 64 channels of wavetable.

Installation was uneventful, with VideoLogic's HTML-based front-end providing online instructions, demos, and a host of installation options, including legacy support. If you must have DOS support, you'll be eating up drivers and resources, so choose with care.

On the sound-quality tip, digital effects came through sharp and crisp: *Forsaken*'s laser blasts and *Quake II*'s explosions rocked the house. Unfortunately, the 2MB of MIDI samples reeked of artificiality, so don't expect the sweeping strings and bombastic percussion of a Roland-caliber wave-synth. Meanwhile, legacy support is strong, with both real-mode DOS tests working without a hitch. Unlike the GMIDI-ready Ensoniq board, you only get crappy FM-synth for real-mode DOS games (DOS in a window gets you MIDI). But the SonicStorm survived our digital joystick gauntlet.

The killer low price and strong legacy support make the SonicStorm a contender, but VideoLogic had better get those new drivers going so we can chuck these wimpy default MIDI patches.



DLS support would make the SonicStorm one helluva sound card. Alas, you're forced to wait until new drivers appear. Drat!

THE STATS: Signal/Noise Ratio: 85db | Total Harmonic Distortion: 20Hz–20KHz ***THE BUNDLE:*** Drivers for Win95 | Audio Rack | Midisoft Studio 4.0 Lite | Mixman 3–Mix

Price ***$99***
Company ***VideoLogic***
Phone ***800.578.5644***
URL ***www.videologic.com***

boot verdict 8

Cool, Thin, **Flat**

LCDs that'll leave you grooving for some tubing

The PanoView 745 desperately needs contrast controls. And what's up with the plasma effect?

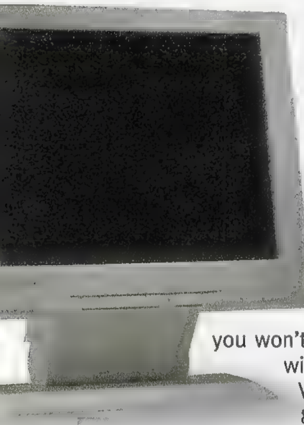
Flat-panel LCD displays still haven't fully realized their potential. In their defense: They weigh next to nothing and require a miniscule desktop footprint. They consume very little power and emit very little heat. They don't redraw (because their LCD cells are either on or off) and therefore don't suffer flicker when running at low refresh rates. And lacking color guns, they cannot experience misconvergence problems.

But flat-panels aren't perfect: They only run well at a single resolution. They're prone to bad off-axis viewing, which means you can't discern screen detail from wide angles. They tend to dither colors that appear solid on traditional monitors. They're disposed to ghosting problems, and even the best screens ship with broken pixels. And they're still extremely expensive.

Nonetheless, flat-panels are ultracool, high-tech dynamos that make you feel like you're a Star Trek *science officer. Optimized for 1024x768/16-bit color, each of this month's Plug-n-Play contenders prove that flat-panel technology is getting better. Unfortunately, none of the three come close to comparing with the kick-ass Compaq TFT500 reviewed in* boot *14.*

—Jon Phillips

ViewSonic VP140



The VP140 is the best of the bunch, ghosting aside.

The 14-inch viewable VP140 is the best flat-panel in this roundup. It boasts superior off-axis viewing and image clarity, and high-res bitmap performance came closest to CRT quality at the same resolution and color-bit depth. The display includes contrast and brightness controls directly on the front panel, but you won't need them if you go with the defaults. The VP140 rocked at 800x600, with very little text degradation and no artifacts in bitmap images (the other displays had obvious bitmap jaggies at this resolution). Text definition at 1024x768 was equal to the PanoView. Color purity and intensity bettered the other two units. And guess what? No stuck pixels!

Unfortunately, the display had very bad streaking problems—but this was the only obvious ding. Still, we've seen much better LCD image quality and off-axis viewing before, so while the 12-lb, 14x14x6-inch VP140 takes top honors this month, it falls well short of kick-ass.

boot verdict 7

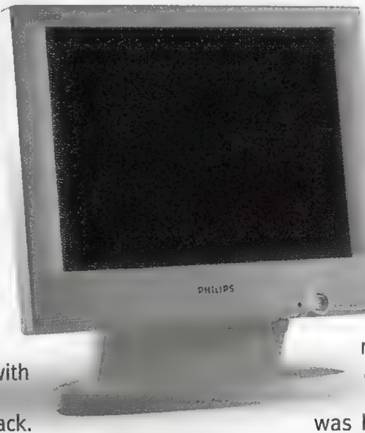
Price *$1,460*
Company *ViewSonic*
Phone *800.888.8583*
URL *www.viewsonic.com*

Philips Brilliance **4500AX**

The 4500AX features brightness and contrast wheels directly on its front panel—praise the lord! Color uniformity and intensity is on par with the PanoView, but image quality is superior. High-res, continuous-tone bitmaps simply look better on this much cheaper, 14.5-inch viewable display. When running 800x600, you must manually expand your display to fit edge-to-edge, but text legibility at this bastard resolution is better than average. Off-axis viewing is also good.

Flaws included stuck pixels, ghosting extending from solid blocks of color, and dubious font definition at 9 pixels (6.8 point). The 11.4-lb, 14.3x14.5x6-inch Philips includes front-mounted speakers, along with a volume control and headphone jack.

While the 4500AX is a contender in this roundup, it hardly represents the apex of flat-panel technology.



Three stuck pixels? Ouch! At least you get contrast control.

boot verdict 6

Price *$1,900*
Company *Philips*
Phone *800.835.3506*
URL *www.philips monitors.com*

CTX **PanoView** 745

The 745 is an otherwise typical display that's marred by a glaring omission: no contrast control. This oversight wouldn't be so bad if the screen shipped with perfect contrast, but it doesn't. Contrast was so bad, we couldn't see any definition in menu tabs. Other dings include glacial control adjustment speed and a strange display quality that makes the screen look like it has a thin film of plasma underneath its glass pane. The unit we reviewed also had an annoying loose pedestal hinge.

In the PanoView's favor, it displayed great color uniformity and intensity throughout all portions of the screen, and suffered only one stuck pixel. Ghosting was just shy of intangible, and off-axis viewing was fine. Arial text was legible at 9 pixels (6.8 point), but degraded into mush at 8 pixels (6 point). When running at 800x600, the screen auto-expands to the full 14.5-inches viewable. Text definition was bad at this resolution.

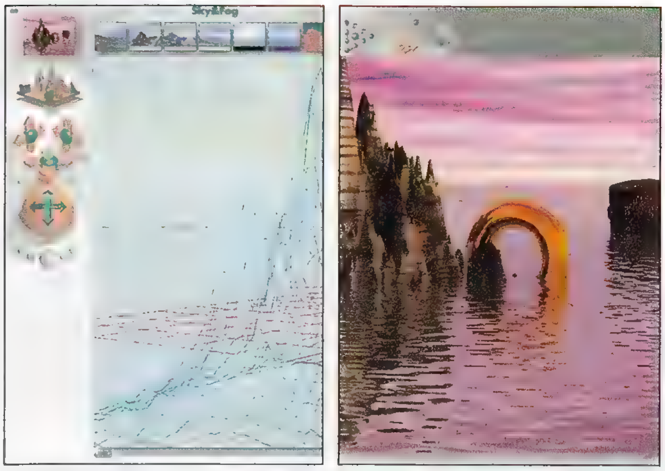
The 15.5x15x7-inch display weighs 12 lbs and includes a swivel base and front-mounted speakers. The ridiculous contrast problem and high price knock the 745 down two verdict points.

boot verdict 5

Price *$2,400*
Company *CTX Opto*
Phone *408.541.6060*
URL *www.ctxoptp.com*

Bryce **3D**

The motion of the ocean



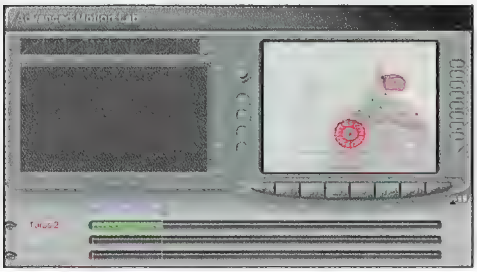
Once you've crafted your fantasy in wire frame (left) rendering the scene with **Bryce 3D***'s raytracing engine makes it a reality.*

Adding "3D" to the *Bryce* name seems an odd move, given that the terrain rendering app has always been in 3D and that the addition in the latest rev is *really* animation. Still, we suppose they couldn't pass up the opportunity (especially with a product as enigmatically named as *Bryce*.)

Not that animation is the only addition to the program.

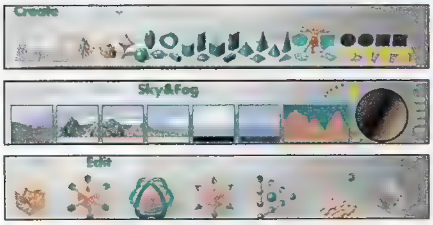
The most welcomed new improvement is the addition of the infinite slab (to go along with the infinite plane). The slab takes the plane concept and adds depth, which makes it perfect for bodies of water and a necessity if you're animating an object passing through the wet stuff.

A stiff competitor for most coveted addition has to be what MetaCreations refers to as Hyper Textures, although you and I know it as volumetric lighting. This effect opens up an entire new world. Instead of textures merely being pasted to the surface of a polygon object, with this new feature they permeate an object. This may not matter when you're dealing with a stone pillar, but it makes all the difference in the 3D world when you're dealing with a shaft of light. And the effects you can achieve with volumetric water texture when creating animations with a moving camera that plunges below the surface are mind blowing.



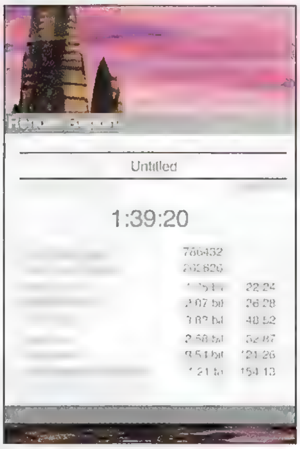
Impress your friends! If the animation you create with **Bryce 3D** *doesn't, this interface will.*

But everything in *Bryce 3D* comes down to one thing: animation. With this version, *Bryce* breaks free of its novelty niche and joins the ranks of *real* 3D apps by adding sophisticated animation tools that allow you to output your movies in resolutions ranging from thumbnail to pro-grade via QuickTime or as an AVI. No longer are you confined to static frames, now you can cruise them in first-person view and make oceans overflow and mountains tumble with a few clicks and drags of the mouse.



Depending on what you're doing, **Bryce 3D** *displays a different overcooked menu, rife with cryptic graphics. These things need a Rosetta Stone!*

Bryce 3D's keyframe animation tools are timeline-based. You set up the scene, drag the indicator forward along the bar, and move your on-screen objects, much like a claymation film works. The benefit is all the tweening (creation of frames in between the keyframes) is done by the computer. If simple point-A-to-point-B motion isn't enough for you, jump into *Bryce 3D*'s Advanced Motion Lab. There you can edit any object using a suite of sophisticated tools that allow you to shape the motion path (graphically displayed as a ribbon) and control its velocity via a time-mapping curve. While handy, this all gets a mite heady, so prepare to calculate these variables in a quiet area.



Even for the relatively simple scene shown here, **Bryce 3D** *required well over an hour to render the scene at 1024x768. And that's just one frame! If you want to make a movie at this res, check into a monastery and get to it.*

In addition to all this, the program has a scad of new environment controls that allow you to take your mind's eye to planets with multiple suns and moons, and have day turn to night (or vice versa) during an animation.

Unfortunately, a few things are missing.

Like its predecessor, *Bryce 3D* cannot export models in DXF format (the exception is the preset models that come with the program). So *Bryce* is a dead end if you're looking to integrate with a more powerful renderer, although the program does import DXF files (albeit with some limitations) along with 3D metafile formats.

One standard feature missing from *Bryce 3D* is the ability to assign behaviors to objects. For example, properties such as elasticity and gravity parameters would make child's play of creating a bouncing rubber ball scene, *if* such features were present. As it is, the program does not even support basic collision detection, so you're condemned to a world of phantom objects.

And given the price of the program and all it can do, it seems gratuitous to ask for a particle generator (or at least a plug-in architecture for a third-party solution), but we will anyway, 'cause it'd be so rad.

Despite this, what this gem provides makes it worth many times the asking price. Once you get beneath the overcooked interface and get your hands dirty, this is the sort of program that'll have you wondering where the time went when you look up at the rising sun. But given the enormity of creating the stacks of ray-traced screens required for even a brief clip (and parallel procesing is *not* an option), nights are best spent rendering your movies while you sleep and dream of tomorrow's fantasy landscape.

—*Brad Dosland*

Price *$199 (upgrade $99)*
Company *MetaCreations*
Phone *800.566.6200*
URL *www.metacreations.com*

boot verdict 9

Gateway 2000 G6-333XL

The Tower of Power

boot KICK ASS! PRODUCT

Gateway's newest offspring, the G6-333XL, comes racked (in a breathtakingly tall, full-sized tower case), stacked (with incredible top-of-the-line components), and packed (with gusto performance). What more could you ask for?

Not much. It has Intel's latest progeny, a 333MHz Deschutes Pentium II. It's crammed with RAM—128MB worth. It's equipped with Adaptec's always-reliable 2940 Ultra Wide SCSI Controller Card and a robust 9.0GB Seagate Cheetah hard drive. It's also replete with Ensoniq's PCI soundcard and STB's Riva-equipped Velocity 128. And if that weren't enough, there's also a TV-tuner card with three separate inputs. So is anything missing?

A Zip drive? Included.

19-inch monitor? Ditto.

Second-generation DVD-ROM with hardware MPEG decoding? You betcha!

TV-out. Wait a minute!

Uh oh. Can you believe it? For a system heading for a coveted 10 rating, the G6-333XL doesn't include a TV-out port. And all the expansion slots are full. But that aside, once you've looked inside the cavernous case, we reckon you'd feel the same way we do about this machine—it's almost an ungraders dream come true. And despite the lack of free slots, you do have extra drive bays to fill. There's a vacant hard drive space too.

Performance is almost off the charts. From gaming to processing to overall system speed, the G6-333XL rocks, and in the process has set a number of new bootRecords.

And while other companies sacrifice components and functionality to shave a few cents off their bottom line, Gateway continues to assemble machines made from the world's finest PC components. Nary a sacrifice has been made with any of the G6-333XL's individual components. Every subsystem is solid muscle. Take video. The Velocity 128 is good enough to appease most 2D and 3D aficionados, but there's also a nifty TV-tuner card (complete with multiple S-Video, coaxial cable, and NTSC video inputs). Even better, there's also a cool software applet that allows you to manage the video sources and capture either streams of video or still images at the touch of a button. The audio subsystem can be feted as well: the combined speakers and PCI soundcard will rock your house. And lest we forget the inclusion of the Ultra Wide SCSI card and an internal Zip drive, let us proclaim: Storage has never been sweeter. In fact about the only negative comment we can muster is the hard drive—it makes quite the racket when spinning.

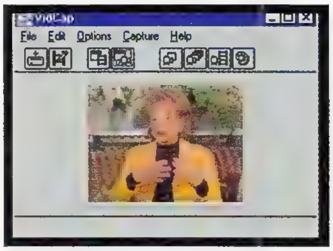
From the standalone components (such as the DVD-ROM's and hard drive's stellar transfer rates) to the complete unit, the G6-333XL is one hell of a machine. Heck, it's almost as if the engineers in the Silicon Prairie purposely designed and built this system with performance satisfaction in mind.

All we can say is, it's about time.

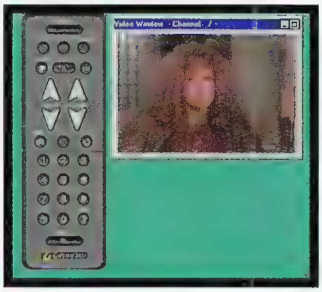
—*Bryan Del Rizzo*

The Riva River Floodeth

For all you Riva owners who felt it necessary to bombard us with letters about driver updates, relax. Gateway has seen the light and included updated drivers that fix the infamous NV3 transparency problems.



WHAT HAPPENED TO HUGH DOWNS?
What's this? Barbara Walters doing a show about sex? Yep, but only on her morning show "The View." Good thing the G6-333XL includes a spiffy video-capture utility, or you never would've known.



I WANT MY PCTV
A virtual remote is also included. You can jump between video sources and access the capture utilities with a push of a button.

under the hood

THE BRAINS	
CPU	Intel Pentium II 333MHz
L2 CACHE	512K pipeline burst
RAM	128MB SDRAM (384MB max)
Motherboard	Intel 440LX
THE BRAWN	
Video	STB Velocity 128 with 4MB SGRAM
Hard Drive	Seagate 9.0GB Cheetah SCSI
CD-ROM	Toshiba DVD-ROM SD-M1102 IDE
Expansion Bus	One ISA, three PCI, one PCI/ISA shared, one AGP
Fax/Modem	Telepath 56.6Kbps X2-compatible (internal)
I/O Ports	Two serial, one parallel, two USB, MIDI/gameport, dual PS/2
THE BEAUTY	
Case	Three 5.25-inch bays; two 3.5 inch-bays
Display	Gateway EV900-19-inch; .26mm dot pitch; aperture grille; 1600x1200 max resolution, 85KHz max refresh rate
Sound	Ensoniq AudioPCI (ES1370) wavetable/FM soundcard
Speakers	Boston Acoustics Media Theatre; two satellites, one subwoofer
Other	Chromatics MPEG decoder board; STB TV-tuner card with video and still-image capture utilities

EXPANSION MAP

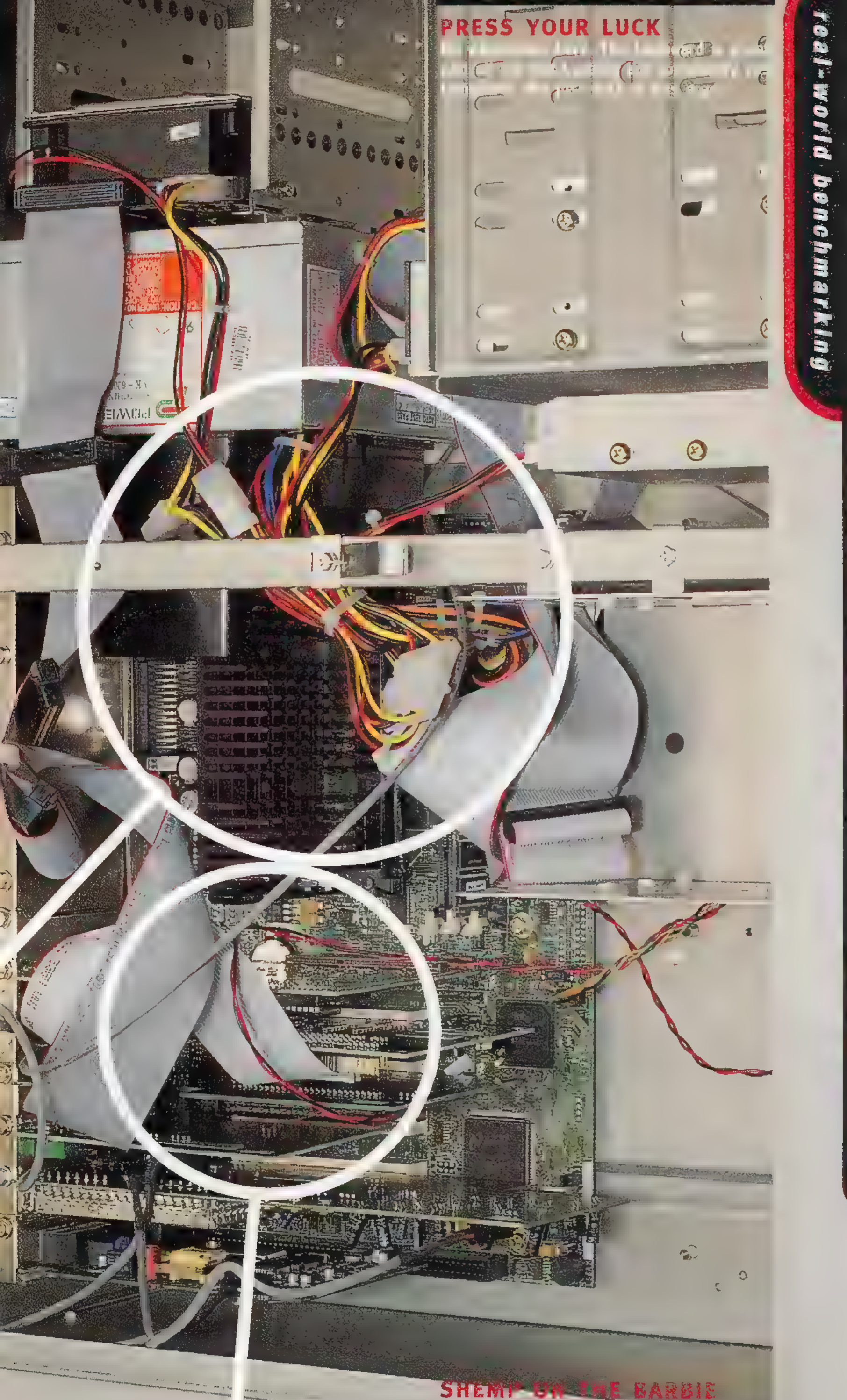
AGP	3D video
PCI	MPEG decoder
PCI	SCSI controller
PCI	Soundcard
PCI	Shared/TV tuner
ISA	Shared/TV tuner
ISA	Modem

THE BUNDLE Encarta I Entertainment Pack: The Puzzle Collection I Greetings Workshop I Choice of Microsoft Action Titles or Microsoft Professional

boot	down
1:05	:06

SPELUNKING WE WILL GO
Check it out: There's enough room inside the case to hide the entire bootCrew. If expansion is your game, this is the place to play.

PRESS YOUR LUCK
[illegible]



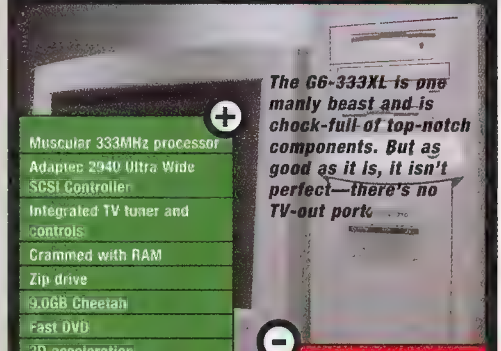
NO ROOM AT THE INN
All the G6-233XL's glory comes at a cost: no free slots for you!

SHEMP ON THE BARBIE
The front panel looked suspiciously like a door. So in typical bootFashion, we popped it off to discover part of the G6-333XL's cooling system hidden in behind. Other cooling components include a huge heatsink and rear dissipation system.

Gateway
G6-333XL

real-world benchmarking

Test	Benchmark	Unit	Score
CPU/MOTHERBOARD	bootMark		160
WIN95 APPS	SYSmark32		would not run
DIRECT3D	ForsakenMark	composite	65.72
HARD DRIVE	Adaptec ThreadMark v2.0	MB/sec	6.36
DVD-ROM	CD Tach/Pro v1.65	K/sec	2320
WIN95 VIDEO	ActiveMovie	% played	100
DOS GAMING	Quake v1.06	fps	33
DIRECTX GAMING	MDK PerfTest v1.4		147
MMX PROCESSING	DeBabelizer Pro	secs	196
CPU/DISK	Microsoft Visual C++ compile	secs	108



The G6-333XL is one manly beast and is chock-full of top-notch components. But as good as it is, it isn't perfect—there's no TV-out port.

+
- Muscular 333MHz processor
- Adaptec 2940 Ultra Wide SCSI Controller
- Integrated TV tuner and controls
- Crammed with RAM
- Zip drive
- 9.0GB Cheetah
- Fast DVD
- 3D acceleration
- PCI audio
- Cavernous case
- 24/7 Toll-free tech support

−
- No free slots
- No TV-out
- Noisy hard drive

Price $4,299
Company Gateway 200
Phone 800.846.2000
URL www.gateway2000.com

boot verdict 9

A complete breakdown of benchmark results is available on the bootNet. Point your browser to www.bootnet.com

CD **ReWritable** Drives

Speed be damned

CD-RW drives are not the wave of the future. For starters, CD-RW media costs around $20 per platter, compared to CD-R's $3 media. And CD-RW discs won't run on every CD-ROM drive. The drive must be multi-read capable, like the Plextor 12/20Plex; unfortunately most drives are not. And recording to CD-RW is as slow as reading from it.

While these drives claim to be 6x readers, they are not. Even the fastest one in this roundup only benchmarks at 5x speed, while the rest wallow in the 4x range. If you can stand the 2x speeds, these drives make acceptable CD-R recorders.

—Sean Cleveland

The Hi-Val HV6200 CD-RW contains a cache buffer of 1MB and supports track-at-once and disc-at-once.

Hi-Val HV6200 CD-RW

Based on the Ricoh MP6200S drive, the HV6200 includes almost everything you need to get up and running. Everything except a SCSI host adapter, that is. Jumpers are also required, but mysteriously not included.

Unlike the Nomai drive, the Hi-Val benefits from Adaptec's newest software-DirectCD v1.01-which makes sense. The drive only supports direct overwriting (files are removed from the directory structure but are not erased).

The HV6200 won the write performance race, but didn't do so well on reads. The drive had no trouble reading CD-RW media written on different manufacturers' drives. The HP may have a more robust feature set, but you'll have to sacrifice the Hi-Val's writing performance to enjoy them.

THE BUNDLE: Adaptec Easy CD Creator 3.0 Standard Edition | Adaptec DirectCD v1.01 | One Verbatim CD-R | One Verbatim CD-RW Media | Internal 50-pin SCSI ribbon cable

boot verdict 8

Price ***$400***
Company ***Hi-Val***
Phone ***714.953.3000***
URL ***www.hival.com***

HP SureStore CD-Writer Plus 7110i

The CD-Writer Plus is the only true CD-RW in this roundup. Employing random erase, the CD-Writer Plus is mesmerizing, as disc space magically appears as files are removed from the CD-RW media.

Without disc-at-once recording you can't burn audio-only discs, and image files are impossible. In fact, the CD-Writer Plus is the only drive here that doesn't include any real recording software. The only way to record data is by writing packets via DirectCD. HP told us it couldn't get the disc-at-once feature right and thus opted not to include it.

Regardless of this flaw, the HP performed admirably. Redbook audio extraction was slow, but outperformed the Maestro nonetheless. The HP nearly reached 6x read times and was faster than any other drive overall, but still failed to deliver its promised speed.

Random-erase must increase file-system overhead, because the CD-Writer Plus has the least disc space to work with. Or HP may have been conservative in its spare block usage. Erasing and reformatting discs on the CD-Writer Plus required the most times of all these drives.

If true CD-RW support is important to you and you don't care about speed, this is your drive. If CD-R is your priority, forget CD-RW.

THE BUNDLE: Adaptec DirectCD 2.0 | Adaptec Easy-CD Audio | Adaptec CD Copier | Jewel Case Designer software | IDE internal cable | One blank HP CD-RW media

boot verdict 6

Price ***$449***
Company ***Hewlett Packard***
Phone ***800.826.4111***
URL ***www.hp.com/storage/cdwriter/index.html***

Synchrome Maestro CD-RW 2 x 6P

The Maestro is a truly portable CD-RW drive running on the Extended EPP port. But this comes at a price.

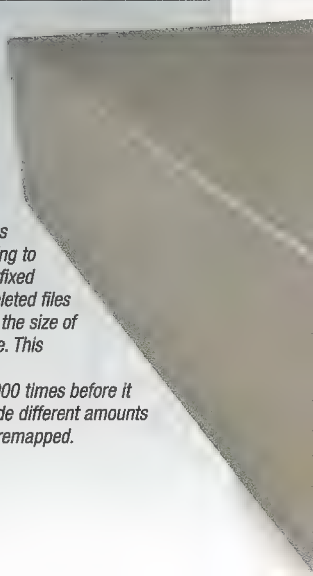
Although we had no trouble getting the unit up and running, we saw temperamental behavior when trying to read CD-RW media from different manufacturers. It passed the benchmarks as expected, but

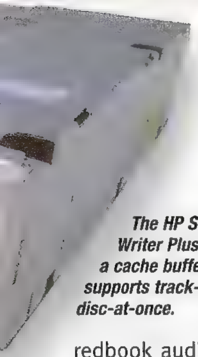
DirectCD 2.0 Part II (The Case of Less Space)

DirectCD gives you the ability to copy files directly to a piece of media, either CD-R or CD-RW, using Window's Explorer, much like you would a hard drive, but at floppy speeds. DirectCD 2.0 *was not available when we last reviewed CD-ReWritable drives (boot 12), where we covered the Philips OmniWriter (bootVerdict 7) and the Ricoh MediaMaster MP6200S (bootVerdict 8). These used* DirectCD v1.0s, *which uses variable-length packets for greater compatibility with the majority of CD-R drives.*

With DirectCD 1.0, *the directory entry is removed when you delete a file, so the file appears gone, but it's actually still there, just not being displayed. Of course, no space is reclaimed.* DirectCD 2.0 *still uses variable-length when writing to CD-R discs because it's write-once media. However, it uses 32K fixed-length packets when writing to CD-RW media. And since the packets are always the same length, they're written in fixed locations, making it easier to track files to support Random Erase, which removes deleted files and frees up space on the media. Now, variable-length packets save space because the size of the packet varies with the size of the data being written. Not all data is the same size. This accounts for some of the lost space, but not all.*

A typical piece of CD-RW media can be written to and erased an average of 1,000 times before it becomes unusable, and bad spots will emerge. CD-RW drive manufacturers set aside different amounts of spare blocks for defect mapping, so that if any worn spots develop, they can be remapped.





The HP SureStore CD-Writer Plus 7110i contains a cache buffer of 768KB, and supports track-at-once but not disc-at-once.

redbook audio extraction was horrendously slow, taking twice as long as other drives here. Disc capacity was less than that of the Ricoh drives, and erasing was a start-and-go-to-sleep affair.

Reads, although faster than the Hi-Val and Nomai drives, put a heavy strain on the CPU. When transferring data at 4x, it consumes a whopping 80% of the load.

Included in the bundle is a utility to attach/detach the drive in Windows, making it easy to disconnect and move to another computer. A CD player is also included, along with SwissKnife for setting interrupts, adjustable transfer lengths, and port access parameters such as burst mode.

On the good side, the Maestro is the only drive in this roundup with an external play button on the front.

THE BUNDLE: Adaptec Easy CD Creator Standard Edition | Adaptec DirectCD 2.0 | One CD-R media | One Philips CD-RW media

boot verdict 4

Price $460
Company Synchrome Technology
Phone 800.767.0085
URL www.synchrome.com

Siege Warfare

All drives were tested with Adaptec's 2940UW using a Seagate Barracuda Wide hard drive

	HiVal HV6200	Nomai 680.RW	Maestro 2 x 6P	HP CD-Writer 7110i
Interface	Internal SCSI	External SCSI	External Parallel	Internal EIDE
Drive	Ricoh MP6200S	Ricoh MP6200S	Wearnes WPI CDRW-622	HP CD-Writer+ 7100
Random Erase Capablities?	No	No	No	Yes
Recorder Tests				
On-the-Fly Torture Test (mins)	16:42	Failed	17:55	18:01
Create 635MB image file (mins)	7:07	5:00	6:58	6:47
Burn 635MB image file (mins)	39:06	39:12	39:37	39:00
Digital Audio Extraction (KB/sec)	677	684	64	344
Time to Extract *By Demons Be Driven* By Pantera (min)	0:46	0:54	2:32	2:21
Packet Writing (635MB) (hr)	1:18	1:10	1:36	0:45
Size of CD-RW Disc (MB)	596	601	579	463
Time to Erase a CD-RW Disc (mins)	38:24	38:32	54:17	56:12
CD Tach Read Tests				
Read 16k Outside Tracks (K/sec)	728	855	858	973
Read 16k Center Tracks (K/sec)	694	836	862	968
Read 16k Inside Tracks (K/sec)	598	597	858	598
Full Stroke Seek (ms)	569	566	512	534
Random Access Seek (ms)	318	311	276	280
CPU Utilization @ 2x (300 K/sec)	30%	30%	52%	31%
CPU Utilization @ 4x (600 K/sec)	60%	57%	80%	41%
CPU Utilization @ 6x (900 K/sec)	Failed	Failed	Failed	45%
2K Burst (K/sec)	233	310	470	1244
8K Burst (K/sec)	49	49	65	59
16K Burst (K/sec)	100	103	114	119
CD Tach Drive Speed	4.3x	4.8x	4.9x	5.2x

Nomai 680.RW Drive

The external SCSI Nomai 680.RW, also based on Ricoh's MP6200S, is the only drive in this round up that comes with all the necessary equipment. Unfortunately it's crippled with *Easy CD Pro 2.0* (Adaptec hasn't supported *Easy CD Pro* for more than six months). While faster than most of the software in this roundup, especially with image-file-creation, *Easy CD Pro* failed the On-the-Fly Torture Test. *DirectCD 2.0* is also included, but because the Ricoh only supports direct overwrite and not random erase, *DirectCD* has no effect on performance. The drive benchmarked close to the Hi-Val, as expected, except its read scores were a bit higher. If Nomai updates the bundle, this drive would be a good buy. Keep your eyes open.

The Nomai 680.RW drive contains a cache buffer of 1MB and supports track-at-once and disc-at-once.

THE BUNDLE: Adaptec Easy CD Pro 2.0 | Adaptec DirectCD 2.0 | Advansys PCI Ultra SCSI Adapter (ABP 960U) | SCSI 25-pin to 25-pin external cable | SCSI 25-pin to 50-pin external cable | Three Nomai CD-R media | One Nomai CD-RW media | Carrying case

boot verdict 7

Price $649
Company Nomai
Phone 408.542.5900
URL www.nomai.com

The Maestro CD-RW 2 x 6P contains a cache buffer of 768KB and supports track-at-once and disc-at-once.

CorelDraw 8

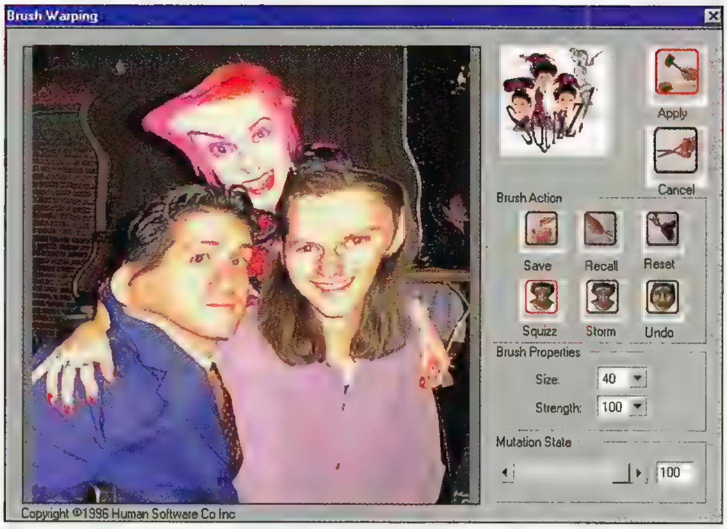
New ideas are running thin

TRY IT ON THE DISC

While *CorelDraw 8* offers more precision controls than any computer artist would ever care to digest, the enormous illustration suite doesn't redefine itself enough to justify a full version jump. The latest iteration of the vaunted vector app focuses on time-saving interface enhancements and streamlined special-effects tools, but offers few innovations that will actually change the look of your artwork at the end of the day.

The most impressive updates are two labor-saving tools that help you quickly execute standard illustration tricks. The Interactive Drop Shadow tool automatically creates a shadow, then lets you adjust its placement and darkness with a few glides of the mouse. Feathering and opacity controls sit conveniently on the main interface's property bar (which changes on-the-fly according to the tool you're using). Perhaps most importantly, text objects can be edited as text after you've applied your shadow—try doing that in Adobe *Photoshop*.

CorelDraw's 3D extrusion tools have always been powerful but clumsy. The Interactive Extrude Tool changes all that, with mouse and property bar controls for depth, perspective, light-sourcing, and bevels. We reckon you'll cut your extruding labor by 300% with this long-overdue streamlining. Unfortunately, the other interactive tools either didn't need to become "interactive" or are downright useless. The new blend and envelope tools offer no significant interface benefits over their predecessors and are conducive to amateurish art. The Interactive Distort tool is the worst of the bunch. Sure, you can use it to tweak an object's vector points en masse according to a particular algorithm, but who'd want to? This hyper-sensitive tool leaves both art and text unrecognizable, and does little more than suggest that computer illustration is more about mathematics than beauty.

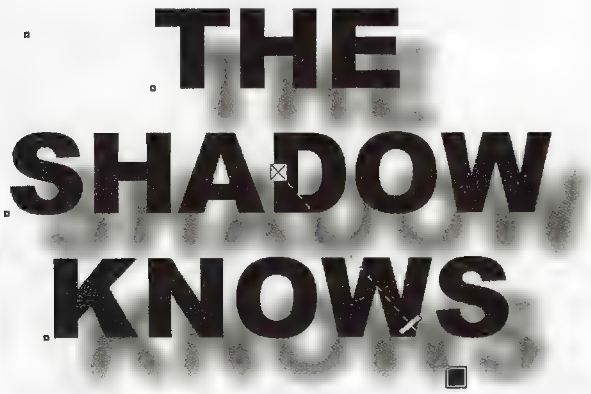


Size: 40
Strength: 100
Mutation State: 100

Copyright ©1996 Human Software Co Inc

The new packed-in plug-ins are almost cooler than CorelDraw itself.

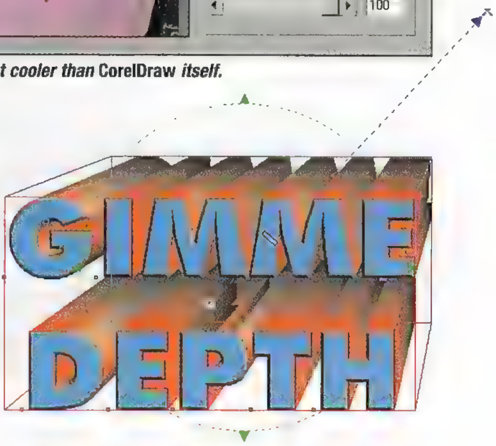
The only other new vector manipulation gizmo is the Knife tool, which lets you bisect closed-path objects according to your own freehand drawing path. You might need this effect, oh, once every three leap years. It seems Corel is running out of vector illustration innovations, and it's no surprise that in this age of *Photoshop*, *Painter*, and *Goo*, the suite now comes packed with more bitmap plug-ins than ever before. Notables include Squizz (a *Goo* ripoff), Alchemy (for *Painter*-esque brushstroke effects), and Fractal Explorer (for Kai Kraussian hippie-rave backgrounds). You also get the application software for Auto F/X Photo/Graphic Edges—an awesome plug-in that quickly applies artistic borders around square images—but not the actual edge files. This is a glaring omission, especially considering the edge embargo isn't mentioned on the product packaging and there's no documentation on where to get the files. We were also disappointed to find that Trendy, the suite's coolest font set, was corrupted and wouldn't load.



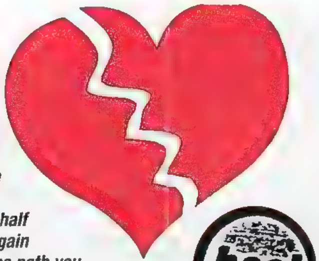
CorelDraw 8's new Interactive Drop Shadow tool even includes feathering options to control the softness of the shadow.

The remainder of *CorelDraw 8*'s enhancements address "productivity." We're talking features such as on-the-fly color mixing, rotatable guidelines, savable workspace environments, and easier selection of buried objects. The list goes on, but it's not the exciting stuff that makes creative types drool. Overall, the suite benefits from the awesome *CorelDraw* legacy and is an incredible value, but don't go for the upgrade unless your boss is paying for it. This latest version is for professionals (as the $700 price tag attests) who need to work faster. Casual consumers can get by fine with version 7.

—*Jon Phillips*



Extrusion depth and angle can now be adjusted via interactive sliders.



Bisect any closed path object with the Knife tool and each separate half will close up again according to the path you created. Hooray!

Price $700 ($250 upgrade)
Company Corel
Phone 800.772.6735
URL www.corel.com

boot verdict 6

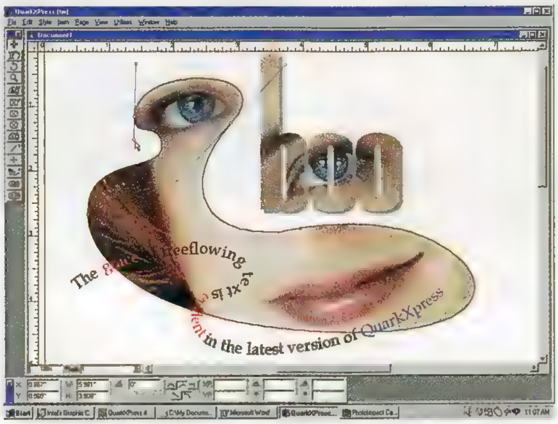
QuarkXpress 4.0

TRY IT ON THE DISC

Six years in Tibet

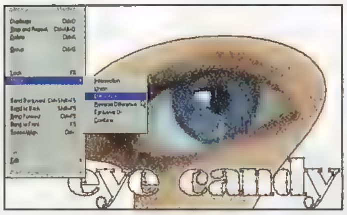
When you make the dominant product in a genre and take six years to come out with a new version, expectations are bound to be high. Such is the case with *QuarkXpress*—and expectations are sky high. Unfortunately the reality is closer to sea level.

Despite adding a reputed 75 new "features" (many of which are merely cosmetic), this long-awaited update may be more closely defined by the features not added, most notably: Internet support. In the face of *PageMaker 6.5*'s array of web features, *Xpress*'s dependence on third-party solutions seems behind the times.



The tools may look the same in **QuarkXpress 4.0**, *but you won't find these sleek bezier curves in any past version.*

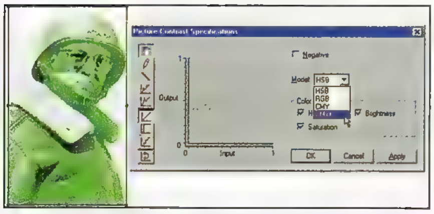
But while you may need to invest in other software for your online repurposing, you just might save that money by not having to buy *Freehand* or *Illustrator* for your more mundane bezier chores. The robust pen tools in *Quark 4.0* make creating custom shapes a snap. Pictures can be imported, text can be bound, and gradient fills and custom strokes can be applied to these smooth boxes. Need a logo fast? Text can be converted to outlines in a single step for custom font manipulation (this conversion also allows you to print the document without the font resource). Measurement bar icons let you control point and segment types. Handy! Most impressively, bezier objects can be combined or split with a powerful set of merge options that rival Adobe's Pathfinder feature.



Once you've converted text to outlines in **Quark 4.0**, *a world of merging options arises.*

The intuitive (perhaps the most intuitive to date) implementation of these tools are without doubt *Quark 4.0*'s shining moment.

Overall, the *Xpress* interface feels the same, but underneath the surface the completely rewritten engine received a massive infusion of intelligence. This is evident in the new tabbed boxes that keep all your options within reach and in the smarter context-sensitive menus and tools. For example, the long-running rivalry between the Item and Content tool has been somewhat defused by reducing restrictions of each. Now the Content tool can select more than one item and you can Get Picture when you're using the Item tool. Aaahhh!



Capable color controls allow you to modify imported images to your taste.

Text overflow is now flagged with a bright red tag. And Apply buttons let you preview the effect of dialogue boxes before committing to them. And transparent boxes stay that way during text editing.

Another moment of inspiration was the decision to make Keep Document Settings the default.

Despite grumblings centering on printing issues, backward compatibility, and saving to network drives (most of which have been corrected with *Quark*'s latest patch), this new version of *Quark* takes distinct steps toward being the end-all-be-all of DTP apps. Here's hoping we don't have to wait until the year 2004 for the next upgrade.

—*Brad Dosland*

Price $995
Company Quark
Phone 800.676.4575
URL www.quark.com

boot verdict 7

Your Motherboard Rocks.

Your Modem Screams!

Your Drive Is HUMONGOUS!

Your System Crashes.

Product Information Number 122

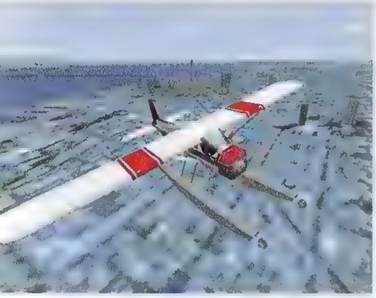
Flight **Unlimited** II

On a wing and a prayer

boot KICK ASS! PRODUCT

At first glance, *Flight Unlimited II* shares little with the original. The entire flight model was rebuilt, abandoning fluid-dynamics simulation in favor of the more conventional data-table approach. *Flight Unlimited* had the gut-feel of flight, while *Flight Unlimited II* goes for the minutiae of modern aviation.

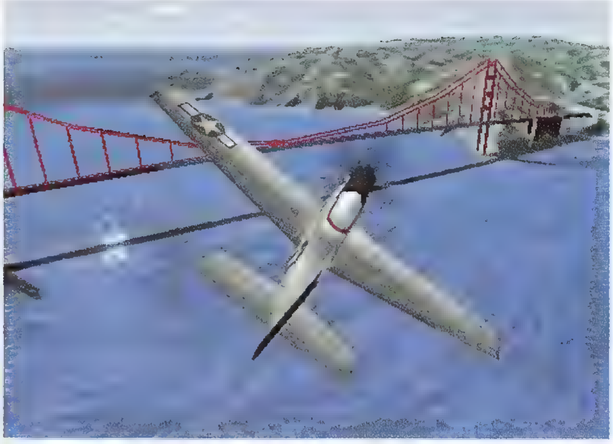
Though you're limited to the San Francisco Bay Area, the sim includes 486 airports. And the scenery is an absolute gas, from the crumpled-velvet mountains of Marin County to the I-can-see-my-house textures of San Francisco and Silicon Valley. Buildings over ten stories are depicted in 3D, via the ZOAR graphics engine.



3D buildings are limited, but details such as clouds make it all look real.

CHECKLIST

Flight Unlimited II
Version: 2.0
Max Res/Color 1024x768/16-bit
Win95 Native
3D Acceleration
Glide Direct3D
DirectX
DirectDraw DirectSound
Specialty Controllers
Flightsticks Force feedback
Throttle



The Golden Gate never looked so good. Note **Flight Unlimited II***'s detailed prop disc.*

Sound is also used to good effect: engine noise pans as you turn your head and radio chatter is dead-on, from traffic procedures to bitingly sarcastic comments from the tower.

Aerodynamics are more realistic than the competition. You can't slow-roll the Beaver float plane, the Piper Arrow is appropriately nimble, and the P51 Mustang feels like the fire-breathing monster it should be.

Viewing modes are also top-notch. You can select either VFR instrument display, showing just the dials pilots use most of the time, or the full IFR panel. Instruments are inert in the virtual-cockpit mode, but the info you need is in a text display at the bottom of the screen.

Aircraft graphics are serviceable, though not as detailed as other sims. But even here there are neat touches, like the intricately shaded transparent propeller animation.

Of course, you'll need major machinery to get this bird off the flight line. Even with 3Dfx under the hood, we had to drop some detail and back off to 512x384 resolution before frame rates hit the double-digits on a plain, old Pentium. However, Pentium II owners are going to be in nirvana.

—Frank Lenk

Price $50
Developer Looking Glass Studios
Publisher Eidos Interactive
Phone 415.547.1200
URL www.eidos-interactive.com

boot verdict 9

Pro **Pilot**

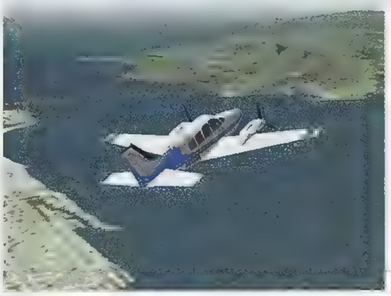
Learning to fly

Obviously rushed out for last Christmas, Sierra *Pro Pilot* sneaked in on a wing and a prayer. Too bad, because the raw edges conceal the product's real virtues.

By modeling only the continental United States and a sliver of eastern Canada, *Pro Pilot* guarantees that no matter where you fly, you'll find believable scenery. From about 3,000 feet up, it works, despite an occasional glint of polygon cracking. At up to 256 square pixels, terrain textures contain meaningful real-world detail.

At lower altitudes, the illusion fades. The game lacks 3D acceleration, so terrain breaks up into a checkerboard of half-acre pixels.

Also, there are just eight fixed internal views and four configurable exterior views. Cockpit detail is crisp, but a true virtual cockpit would have been better, as would the ability to pan the outside view dynamically. On the plus side, numeric instrument read-outs are available in views where the instruments aren't.



Prepare for a water landing with **Pro Pilot.**

CHECKLIST

Pro Pilot
Version: 1.0
Max Res/Color 640x480/8-bit
Win95
DirectX
DirectDraw DirectSound
Multiple CDs
Specialty Controllers
Force feedback Throttle
Rudder

At up to 500 polygons, aircraft are well rendered, but the selection of planes is oddly constricted, with three Beechcraft, including two big corporate twins; the Cessna Citation bizjet; and the inevitable Cessna 172.

Still, the bells and whistles make it worthwhile. You can create complex flight plans, and air traffic control voices will keep you to them. A copilot will tell you where to go and pop up a GPS map to show where you are.

Unfortunately, these slick features are a pain to figure out. The included "Flight Companion" is thick but contains nothing about how to operate *Pro Pilot* itself. All vital info is buried in readme files.

Frame rates cruise comfortably in the teens even on a low-end Pentium, but the pauses for texture loading can be endless.

Still, when it comes to cross-country navigation, *Pro Pilot* is the new flight leader.

—Frank Lenk

Price $60
Developer Dynamix
Publisher Sierra On-Line
Phone 800.757.7707
URL www.sierra.com

boot verdict 7

Twinkling **Trinitrons**

Bright-ass Sonys ain't aperture-grille phonies

Everybody is selling aperture-grille monitors these days, but only Sony and Mitsubishi actually make the cathode-ray tubes that ship in these babies. Unlike shadow-mask technology, which shoots electrons through a grid, aperture-grille technology shoots electrons through unbroken vertical stripes that allow more light to pass through, resulting in brighter displays. Sony has just updated its Trinitron line, and since podunk monitor manufacturers will inevitably license all this weird science and stick it inside their own plastic, we thought it best to review the Sony-branded CRTs first. The GDM-400PS houses the first 19-inch aperture-grille CRT. The GDM-500PS is the new 21-inch Trinitron flagship.

—Jon Phillips

boot KICK ASS! PRODUCT

Sony's new 19-inch **GDM-400PS** is bright, true, and flat, flat, flat—a wonderful alternative to the bulbous Hitachi shadow-mask CRT in every 19-incher that shipped last year. The Hitachi-based monitors kick ass, but the world needs an aperture-grille 19-incher.

The 400PS offers an 18-inch viewable, does 1600x1200@75Hz and 1280X1024@85Hz, and displays brilliant color. *DisplayMate*'s Video Obstacle Course revealed impeccable color consistency throughout all portions of the screen, and geometric distortion was imperceptible. Color convergence was just shy of perfection, displaying only the most niggling green-red misalignment.

With a varying grille pitch of 0.25mm in the center of the display widening to 0.27mm on the edges, pixel sharpness was excellent but deteriorated slightly on the corners during focus tests. Nonetheless, 0.27mm is still a fine pitch, you'll probably never notice the scaling during everyday use.

The 400PS costs $250 more than its cheapest 19-inch competition and is worth the price if you need the brightest, flattest monitor in this size category. Whites beam radiantly, blacks are dark as midnight, and colors crackle with intensity. And at just 55 lbs. and 17.5x18.5x18 inches, the 400PS feels more like a 17-incher thanks to the new "short-neck" design. But the display isn't perfect: The grille makes fine horizontal lines look much thicker and brighter than vertical lines of exactly the same width. The effect became very apparent working with hairlines in vector-based drawing programs. The phenomenon is intrinsic to all aperture-grille displays (along with the two fine damper wire shadows running horizontally across the screen), but we've never seen it this pronounced before.

The 500PS is the first monitor we've seen with no misconvergence.

The 21-inch **GDM-500PS** shares the exacting detail and brilliance of its smaller brother. You get the 0.25mm to 0.27mm variable grille pitch, 19.8 inches viewable across an extremely flat screen, and 1600x1200@85Hz. *DisplayMate* testing revealed amazing clarity: excellent color purity, zero geometric distortion, and great pixel detail. Like the 400PS, the 500PS makes fine horizontal lines look thicker and brighter than vertical lines of the same width. But unlike the 19-incher, color convergence was absolutely perfect.

Aside from the line-intensity inconsistency, the only issue that keeps these nearly identical units from 10 bootVerdicts is their price. Each needs to be $200 cheaper.

The first aperture-grille 19-incher ever.

Price $1,100 (19"), $1,800 (21")
Company Sony
Phone 800.352.7669
URL www.ita.sel.sony.com

boot verdict 9

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Product Information Number 123

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Battlespire: An Elder Scrolls Legend

Trapped in a pixilated dungeon

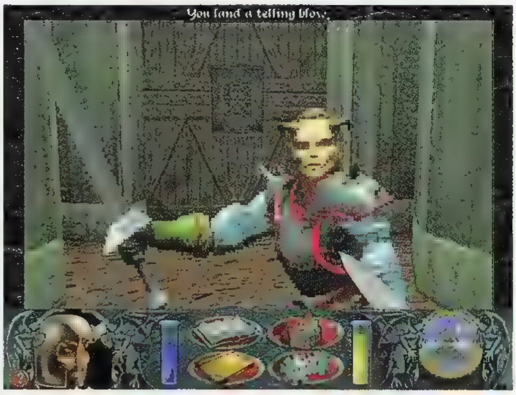
The latest *Elder Scrolls* adventure is a tepid rehash of last year's much-ballyhooed, but beleaguered, *Daggerfall*. All the elements of a great RPG are here, but *Battlespire* just can't escape from the pit of mediocrity. The dated graphics will fill you with 1996 nostalgia, the ill-wrought battle/dialogue interface will make your teeth hurt, and the slow pace of the game will sedate many a rabid adventurer. The exquisitely crafted and detailed character-generation system seems out of place in the pixilated depths of *Battlespire*.

Those of you hoping to bust out with 3D-accelerated haughtiness will be disappointed. Dust off those VESA drivers, because *Battlespire* doesn't support 3D acceleration. Anchored by pixilated textures and sprites, *Battlespire*'s clipping problems cause weapons to disappear into walls, and odious perspective correction will cause creatures to bloat in the head and shrink in the ankles when you look down at them. High-res mode only brings pain and frustration as frame rates churn at 5fps with a host of sprites on screen. Low resolution brings a much improved, but still abhorrent, 20fps.

The shining star of *Battlespire* is the character generator; you can fashion even the minutest detail of your character, from facial expressions to a horde of skills, abilities, and equipment. Ripped from *Daggerfall*, the character generator is the sweet icing on a stale cake.

Battlespire may be multiplayer (via Mpath or IPX), but it seems out of place in an RPG that depends so heavily on mood and intricate puzzles. Be that as it may, *Battlespire* is lost in the times, unable to catch up to the competing market. Let's hope that the next *Elder Scrolls* adventure takes full use PC technology to create a remotely compelling game experience.

—Dan Simpson



Battlespire's denizens may be pixilated, but they'll wallop your ass.

CHECKLIST

Battlespire: An Elder Scrolls Legend
Version: 1.0

Max Res/Color 640x480/16-bit
MS-DOS
Multiplayer
LAN IPX

Foul fiends run amok in the tedious bowels of **Battlespire.**

Price ***$55***
Company ***Bethesda***
Phone ***800.677.0700***
URL ***www.bethsoft.com***

boot verdict 5

Tone **Rebellion**

A pretty mish-mash

The Tone Rebellion attempts to put a new spin on the already-overcrowded strategy genre by mixing in adventure elements. Unfortunately, it falls short in both genres.

The game starts strong with a well-thought-out story line. The floaters' (who vaguely resemble jellyfish) island universe has been shattered by the evil Leviathan, and over time, different tribes have formed, each with unique abilities. Your job is to defeat the Leviathan and reunite the floaters' shattered world.

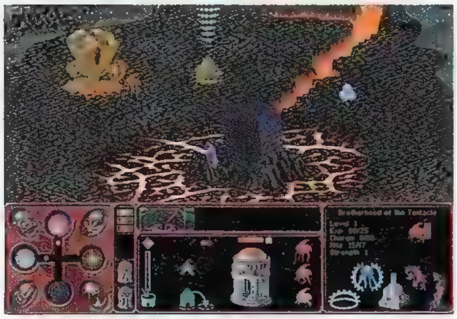
Beyond this, the game fails to fully plumb the depths of the story. The strategy elements turn into a slug-fest, and the adventure is no more than a treasure hunt. You have no opportunity to upgrade weapons or discover new resources. You can eventually upgrade certain buildings, but it doesn't affect the game. The floaters' AI is so badly crippled that you end up completely frustrated—getting the little guys to do what you want is an exercise in futility. You want to find the Leviathan just to feed them to him.

The Tone Rebellion is pretty to look at, with its hand-drawn 2D-sprite graphics. Each island has a unique atmosphere, and exploring them is about the only reason to continue playing.

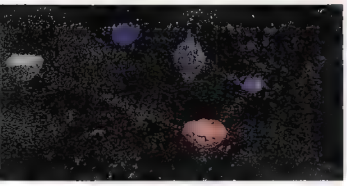
The hauntingly beautiful music is superb and keeps pace with the elegance of the different worlds. When you blow something up, the explosions sound realistic and give your subwoofer a workout.

While *The Tone Rebellion* is beautiful, its gameplay becomes annoyingly repetitive within a few short hours. If you're looking for a good strategy game, try something with a different tone.

—Paula Reaume



The floaters are trying to blow up one of the many Leviathan spawners you'll encounter in **The Tone Rebellion.**



In **The Tone Rebellion** *you need to unite the shattered island universe and save the floaters from the evil Leviathan.*

CHECKLIST

The Tone Rebellion
Version: 1.20E

Max Res/Color 640x480/8-bit
Win95/NT Compatible
DirectX
DirectDraw DirectSound
DirectPlay DirectInput
Multiplayer
LAN Modem Direct/serial
TCP/IP

Price ***$50***
Developer ***The Logic Factory***
Publisher ***Virgin Interactive***
Phone ***408.625.1004***
URL ***www.vie.com***

boot verdict 5

AD INDEX

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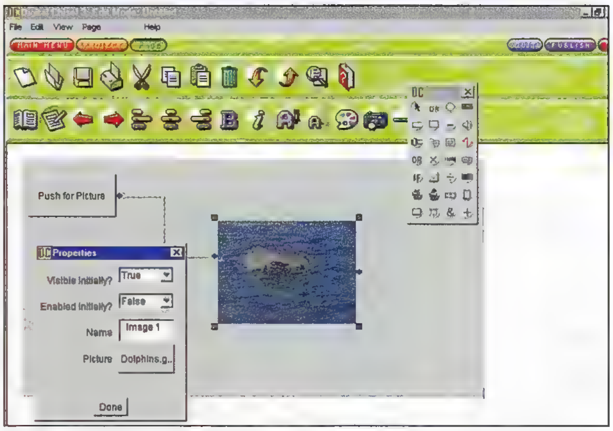
Pages Made **Easy**

Code away!

Web coding keeps getting simpler and more accessible. Below we look at two development tools geared mainly toward the novice and educational markets. Digital Chisel, *unique and ambitious, is built completely with Java native code.* Agile *has the potential to be a great starting point for those just beginning and wishing to make pages that are compliant to a particular HTML version.*

—Tara Calishain


File
Edit
View
Page
Help
MAIN MENU
PUBLISH

Push for Picture

Properties

Visible Initially? True

Enabled Initially? False

Name Image 1

Picture Dolphins.g..

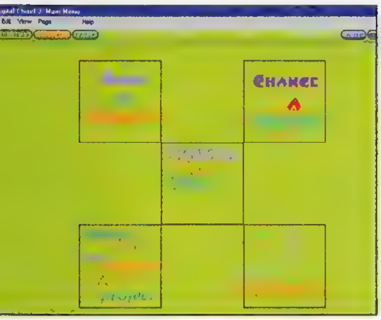
Done

The Workbench takes some mystery out of making Java Beans, but the resulting content isn't viewable by any browser except* Digital Chisel*'s.

Digital **Chisel**

The latest incarnation of *Digital Chisel* is as confusing as it is powerful. It has a mighty Workbench for creating content, but only *Digital Chisel* users can see it. Its WYSIWYG HTML editor is designed for beginners, but you can't resize graphics with it.

Digital Chisel is also ambitious—it's written completely in Java. That's good for platform independence but bad for fast loading—there was a noticeable wait on our Pentium 150 with 96MB of RAM. And while *Digital Chisel* was created as an educational/ classroom tool, most schools won't have the recommended P133 with 32MB of RAM. But as an educational item, *Digital Chisel* rates strongly. Its three eye-catching interfaces—elementary, middle, and advanced—are appropriate for each age group (elementary has larger icons, while advanced has extra tools).


Digital Chisel 2: Main Menu
Edit
View
Page
Help
CHANCE

Digital Chisel *offers different interfaces based on user level.*

The HTML editor works well in all environments. A project-management screen shows a web site as a series of pages and delineates the links between them. Click on a page and you're taken to an HTML editor.

A standout item in the editor is the Workbench, which lets you combine Java elements and create Java Beans—Java content within pages. It's an excellent way to put Java capabilities within the author's reach. Once pages are created, *Digital Chisel*'s publishing tool compresses and copies the material for e-mailing or FTPing.

That's the good news. The bad news is that while Java applets can be inserted into a *Digital Chisel* page and are viewable without problems, content created using the Workbench is not, at this writing, viewable by any browser except *Digital Chisel*'s, which, while adequate, is no substitute for *IE* or *Navigator* and minimizes the potential audience for Workbench content.

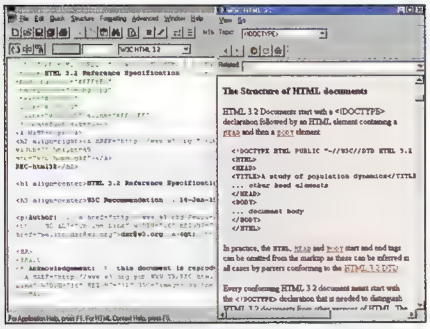
Schools that need to serve several levels of HTML knowledge, or families that want to have one HTML editor for everyone, will appreciate *Digital Chisel*'s strong educational slant and different levels of presentation. *Digital Chisel* pushes the envelope but ultimately falls short.

Price $199
Developer Pierian Spring Software
Phone 800.213.5054
URL www.pierian.com

boot verdict 6

Agile

Agile dishes up a happy medium between the markup control of a WYSIWYG editor and memorizing HTML code. The program's non-WYSIWYG interface feels like a text editor, with the basic ‹HTML› and ‹BODY› tags to get you started. Type in code directly and it'll take on user-configurable colors for easy editing, or enter your code and format it via the menubar. Frequently used code can be saved as a template or a "Snippet."


File
Edit
Quick
Structure
Formatting
Advanced
Window
Help
View
Go
Info Topic:
<!DOCTYPE>
Related
W3C HTML 3.2

The Structure of HTML documents

HTML 3.2 Documents start with a <!DOCTYPE> declaration followed by an HTML element containing a HEAD and then a BODY element

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 3.2
<HTML>
<HEAD>
<TITLE>A study of population dynamics</TITLE
... other head elements
</HEAD>
<BODY>
... document body
</BODY>
</HTML>
```

In practice, the HTML, HEAD and BODY start and end tags can be omitted from the markup as these can be inferred in all cases by parsers conforming to the HTML 3.2 DTD.

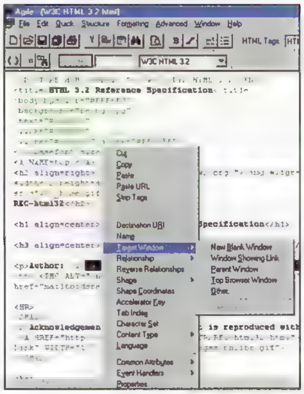
Every conforming HTML 3.2 document must start with the <!DOCTYPE> declaration that is needed to distinguish HTML 3.2 documents from other versions of HTML. The

For Application Help, press F1. For HTML Context Help, press F1.

Agile's context-sensitive HTML help gives you tons of tag information.

Agile can create code for a variety of standards, from HTML 2.0 to *IE 4.0*. In addition, *Agile* offers HTML-context help and references for understanding the markups.

This convenience is underscored by the ability to right click on any HTML markup to set its properties. For example, on the HTML 2.0 setting, you can only insert a horizontal rule. On the HTML 4.0 setting, you can insert a horizontal rule and adjust its properties. *Agile* also adjusts menus to reflect your HTML version (the 2.0 standard removes the frame commands from the menus, for example). Once you've finished coding, click once to preview the page in a browser.


Agile - [W3C HTML 3.2 html]
File
Edit
Quick
Structure
Formatting
Advanced
Window
Help
HTML Tags
W3C HTML 3.2
Cut
Copy
Paste
Paste URL
Strip Tags
Destination URL
Name
Target Window
Relationship
Reverse Relationships
Shape
Shape Coordinates
Accelerator Key
Tab Index
Character Set
Content Type
Language
Common Attributes
Event Handlers
Properties
New Blank Window
Window Showing Link
Parent Window
Top Browser Window
Other

Right-clicking in* Agile *gives you quick access to a tag's properties.

A couple of things distract from *Agile*'s friendliness. "Snippet" is not listed in the help files index, for example, and adding a snippet is not intuitive. Adding tables and frames can also be a hassle for the novice. But overall *Agile* is a solid program—plenty of extras for the pro, plenty of support for the novice.

Price $75
Company Compware
Phone N/A
URL www.compware.demon.co.uk

boot verdict 8

Compaq **Presario** 4860

New chip, same problems

The Pentium II 300MHz-equipped Presario 4850 (reviewed in *boot* 17) proved quite the little powerhouse. Unfortunately, the system was none-too-bright in terms of design. But with Intel's Deschutes quickly making the rounds of system OEMs, the 4850 has been sent out to pasture. Taking its place is the Presario 4860.

So what's the diff? Well, aside from the obvious processor punch and updated video drivers, not much. In fact, all the problems associated with the 4850, including the dreaded LPX formfactor, insane case design, and soldered-on-the-motherboard-so-there's-no-way-in-hell-you'll-ever-be-able-to-upgrade-the-AGP video card, are still here. Perhaps it was too ambitious to expect Compaq to completely overhaul the system in a couple of months.

Frankly, we can't help but be disappointed with the 4860. While its performance improved upon the 4850's, the increase wasn't significant. The bootMark of 157 (up from 144.7) was right on the money with other Deschutes systems we've seen. *Quake* was all of 1fps faster, and our C++ compile took 30 seconds less (22% faster). But while the 4860 was noisily toiling away with our SYSmark32 test (eventually scoring a seemingly respectable 278), the similarly equipped and priced NEC Direction SPL 333 (reviewed in *boot* 19), scored a nerve-rattling 429. Holy-wack-a-moley.

And if you hate the pre-installed Active Desktop, you can uninstall the whole shebang—including *IE 4.0*—but only with about five or six mouse clicks. We noticed a miniscule performance increase after doing this, but then our system became unstable (SYSmark32 choked big time), giving credence to Microsoft's assertion that *IE 4.0* is a part of Win95. Good thing Compaq includes quick-restore disks.

We harped on Compaq last time for not including a TV-out port, and we'll lob whine again. Because the 4860 utilizes a soft-DVD solution, Compaq must integrate the copy protection (normally built into the decoder chip) into the software. As such, even if you installed another PCI video card with TV-out (à la Canopus's Pure3D), you're pretty much SOL. You can't override the onboard video.

One victory: the 4860's software bundle is killer—especially the copy of Rage Software's yet-to-be-released AGP-enhanced game *Incoming*. This, not the processor, was the biggest surprise overall.

—*Bryan Del Rizzo*

under the hood

THE BRAINS

CPU	Intel Pentium II 333MHz
L2	Cache 512K pipeline-burst
RAM	32MB SynchDRAM (256MB max)
Motherboard	Intel 440LPX

THE BRAWN

Video	AGP ATI Rage Pro (with 4MB SGRAM)
Hard Drive	Various 6.5GB EIDE
DVD-ROM	Hitachi 2x
Expansion Bus	Two PCI, three ISA, one shared
Fax/Modem	56Kbps K56flex-compatible
I/O Ports	Two USB, one parallel, two serial, one game/MIDI, RCA video-in and audio-out, one monitor, stereo-out, microphone-in

THE BEAUTY

Display	Optional 1725S 17-inch screen with built-in JBL speakers
Sound	ESS1887 FM-synth only
Speakers	JBL Pro stereo speakers (on monitor only)
Other	Volume control on monitor and case

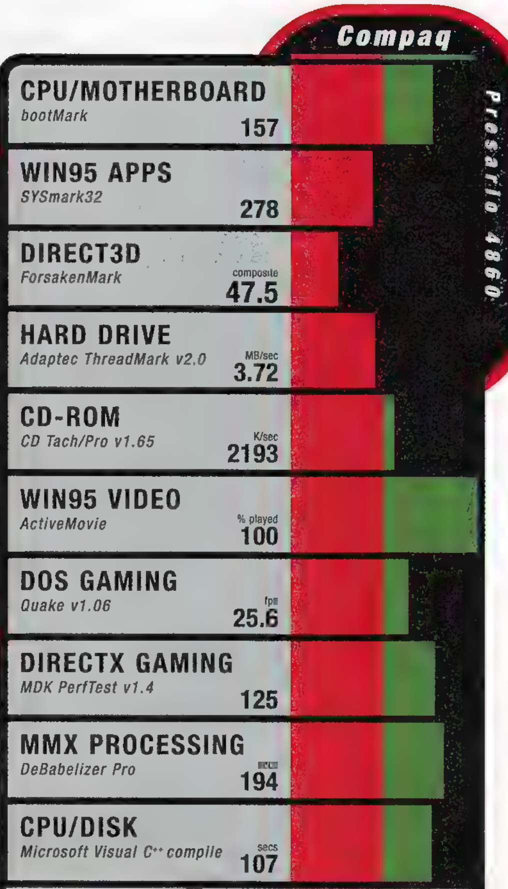
EXPANSION MAP

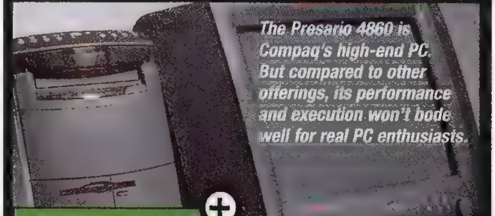
ISA	Fax/Modem
ISA	Free
PCI	Free
PCI	Free
PCI	Shared
ISA	Free
ISA	Free

THE BUNDLE Wing Commander IV (DVD) | Incoming (AGP-enhanced) | Moto Racer | Photo Express | Money 98 | Bookshelf 98 | Encarta 98 Encyclopedia

boot 1:05 **down** :06

real-world benchmarking





The Presario 4860 is Compaq's high-end PC. But compared to other offerings, its performance and execution won't bode well for real PC enthusiasts.

+

- Pentium II 333MHz with enormous heatsink
- AGP 2x ATI Rage Pro
- DVD-ROM
- Software bundle rocks!
- Programmable one-touch buttons
- Hard drive capacity
- Video playback

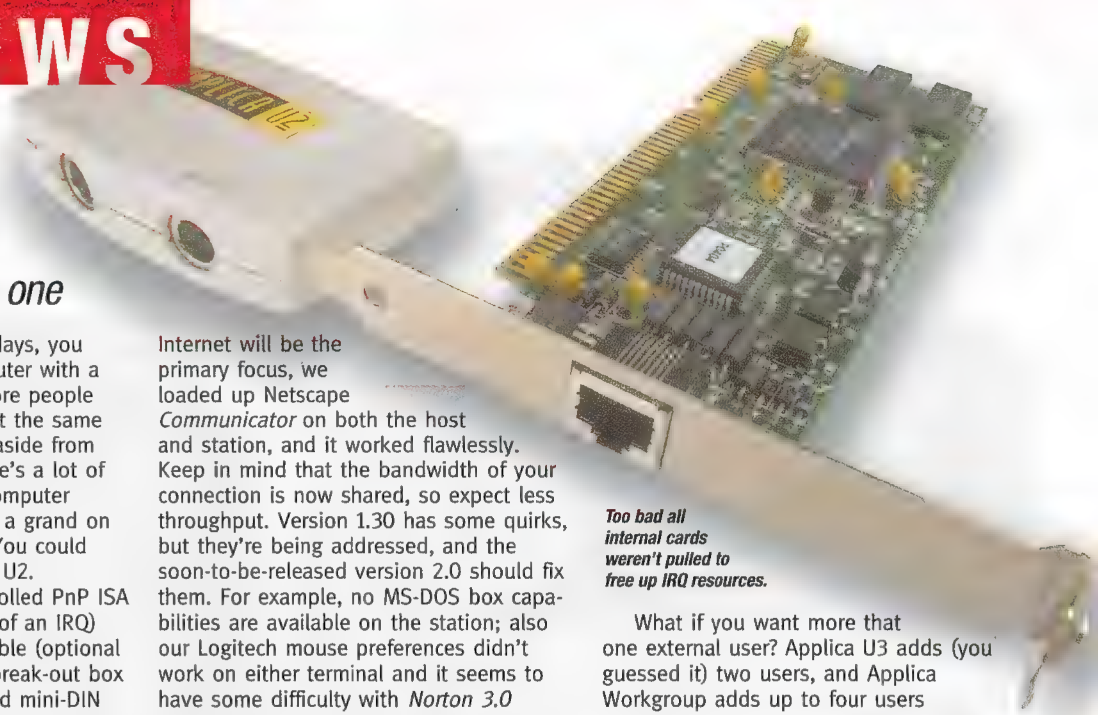
−

- Active Desktop eats CPU power
- AGP soldered on motherboard
- LPX motherboard
- No TV-out
- FM-synth

Price $2,499
Company COMPAQ
Phone 800.345.1518
URL www.compaq.com

boot verdict 7

A complete breakdown of benchmark results is available on the *bootNet*. Point your browser to www.bootnet.com



Applica **U2**

Two hearts beat as one

Like many households these days, you probably have one nice computer with a net connection and two or more people who want to use it—usually at the same time. What are your options, aside from buying a second system? There's a lot of buzz regarding the network computer lately, but who wants to drop a grand on a computer without storage? You could time-share, or get the Applica U2.

The U2 is a combination polled PnP ISA card (which doesn't rape you of an IRQ) tethered by a 15-foot RJ-45 cable (optional 50-foot cable available) to a break-out box with VGA, and PS/2 mouse and mini-DIN keyboard ports. Once installed, simply run the Control Center and voila—an instant second virtual station complete with multiuser login and preferences and a maximum resolution of 800x600/16-bit. There's even a messaging system so users can communicate with each other. A P166 with 32MB is recommended, but not required.

So what can you do with it? Most anything you can do now with your current system, sans audio. Guessing that the Internet will be the primary focus, we loaded up Netscape *Communicator* on both the host and station, and it worked flawlessly. Keep in mind that the bandwidth of your connection is now shared, so expect less throughput. Version 1.30 has some quirks, but they're being addressed, and the soon-to-be-released version 2.0 should fix them. For example, no MS-DOS box capabilities are available on the station; also our Logitech mouse preferences didn't work on either terminal and it seems to have some difficulty with *Norton 3.0 Utilities*. Though it's not sold as a gaming platform, we tried to run *Quake* on the U2—unsuccessfully. Neither *GLQuake* server nor *WinQuake* ran. In hardware mode, *Quake II* ran on the server only. Using software mode, it ran on both, but it was unplayably slow.

But for most users, this seems like the ideal solution to make a single-user OS feel like a multiuser OS fairly painlessly and inexpensively.

Too bad all internal cards weren't pulled to free up IRQ resources.

What if you want more that one external user? Applica U3 adds (you guessed it) two users, and Applica Workgroup adds up to four users per card, with the only limitation being ISA slots.

—*Daevid Vincent*

Price $250
Company Concurrent Controls
Phone 800.487.2243
URL www.applica.com

boot verdict 9

Nightmare **Creatures**

Afflicted with schizophrenia

CHECKLIST
Nightmare Creatures
Version: 1.0
Maximum Resolution/Color
1024x768/16-bit
Win95 Native
3D Acceleration
Direct3D
Native 3D Hardware Support
PowerVR
DirectX
DirectDraw DirectSound
DirectPlay DirectInput
Specialty Controllers
Win95 compatible

In the current spate of genre-mixing games, *Nightmare Creatures* is crushed beneath the weight of its own ambitions. Part adventure game, part fighting game, and part platform game, *Nightmare Creatures* suffers from a mixed-identity that never manages to sort itself out. Taking gothic horror to places it should never have gone, *Nightmare Creatures* skulks the gaslit streets of 19th-century London. Steeped in a brooding atmosphere, *Nightmare Creatures* contains some seriously disturbing and horrifying creatures.

Be prepared to wipe bloody entrails off your swords, 'cause the body count in Nightmare Creatures *is plenty high.*

Sharp graphics are a boon, with Direct3D enhancements and acceleration for PowerVR. *Nightmare Creatures* transitions to the PC with flying colors at 640x480/16-bit (up to 1024x768/16 bit) with filtering and anti-aliasing effects, putting its console counterpart to shame. Characters are composed of 600 polygons, and enemies are sharply animated and fluid. Still, sharp graphics will push a game only so far.

The biggest strike against *Nightmare Creatures* is the heinous control. Precise control, particularly important with fighting games, is absent. Instead, characters react herky-jerky from even the slightest touch and swipe air long after their opponents have fallen. Even maneuvering your character in front of power-ups can be a chore. This, combined with a wildly spinning camera, turns *Nightmare Creatures* into a gory mishmash of half-baked genres.

Detailed textures and eerie city streets create a brooding atmosphere heavy with tension.

Nightmare Creatures attempts to do too many things at once, and comes up short on all fronts. The thin storyline and weak adventure puzzles won't hold the average gamer for long. Top it off with some frustrating controls, and *Nightmare Creatures* is an all-around disappointment.

—*Dan Simpson*

Price $50
Developer Kallisto
Publisher Activision
Phone 310.255.2000
URL www.activision.com

boot verdict 4

Pocket **Picture** Power

Perfect pixel postcards

As much as we may drool over the megapixels of today's burliest digital cameras, one fact remains: the most powerful camera is the one you have with you when you need it. Even Kodak's $15,000 pro camera doesn't do you a lick of good if it's sitting in the bag back in the hotel room when the UFO lands.

The key to this sort of power is size, or lack thereof. Sometimes the ability to tuck a camera in your shirt pocket means more than all the resolution in the world.

—Brad Dosland

No, the back of Toshiba's PDR-2 doesn't open to accept film—that's the PC card interface swinging out, sister.

Toshiba PDR-2

It's a PC card... It's a digital camera... It's two, two, two peripherals in one. Actually, it's Toshiba confronting the challenge of integrating a hardware interface into a pocket-size part. The solution: attach a flip-out PC card to the back of the camera.

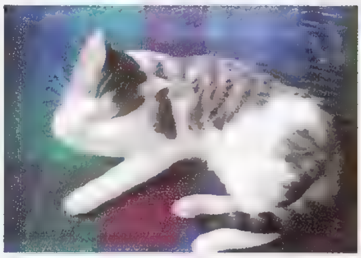
This decision has its pros and cons.

First and foremost, you currently need a PC card slot to use the camera (Toshiba promises a floppy drive adapter, but none was available at press time). This means you're limited to using it with a notebook or buying an exotic PC card drive for your desktop PC. Another option is a SmartMedia reader, such as the one featured in this month's Pure Lust (page 18).

And on one hand, the integrated design lets you leave the cables at home and travel unencumbered. But the addition of the card makes the formfactor a quarter-inch thicker than Umax's offering. Still, the PDR-2 is fully pocketable (even in tight blue jeans).

Another size concession was the 3v lithium battery instead of AAAs. While battery life is slightly longer, finding a replacement in the field is a real bitch.

Also, the PDR-2 weighs 50% more than the PhotoRun, tipping the scales at over 6 ounces. Still, this camera is no heavyweight, although you'd never know it from the images. WIth the included *Image Expert* software, you can simply drag-and-drop the 640x480 24-bit images onto your hard drive from the svelte 2MB SmartMedia. The camera holds 24 images at its highest res, four times the PhotoRun's capacity, and up to 48 images in standard mode. And the PDR-2 comes with a second 2MB SmartMedia card, a considerate gesture more companies ought to consider.



While the PDR-2 has brighter colors, its images suffer from motion blur... even in direct window light.

Price $399
Company Toshiba
Phone 800.288.1354
URL www.toshiba.com

boot verdict 6

Umax **PhotoRun**

Easily the smallest digital camera this side of *Mission: Impossible*, the PhotoRun makes Palm's pocketable PDA feel big, weighing in at 4 ounces. Unfortunately, this minute size comes at a price.

Neither camera in this roundup comes with a flash, so plan on shooting in open light. With a maximum resolution of only 504x378, the PhotoRun's images barely make muster for even web usage. The 2MB Compact Flash holds some six images at that resolution and 15 at the "standard" res of 320x240. And with a "focus-free" lens the diameter of a pinhole camera, image quality is understandably spotty.

To save precious space, image transfer is via an included Compact Flash card drive that runs inline with the parallel port and is powered by the keyboard cable. You simply pop the memory out of the camera and slide it into the slot on the mini-drive. Or you can pop it into a PC card adapter. Either way, downloads are a snap.

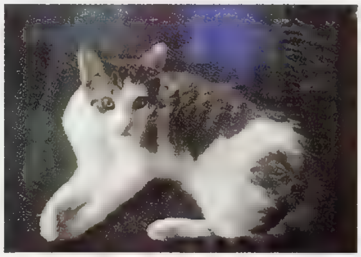
The PhotoRun comes with Adobe's *PhotoDeluxe*, which comes up short especially when compared to the *LivePix SE* that comes with Toshiba's PDR-2 camera.

The camera and card drive come with faux-leather pouches. The drive's holds all the cables you'll need and the camera's attaches to your belt.

Then Umax goes the extra yard and includes a heavy-duty Aquapac baggie for underwater shooting.

And all this under $300. Sweet.

If you're willing to do all your shooting in direct sunlight and you're not looking for pro-caliber quality, the PhotoRun might just be the most powerful digital camera ever made.



The PhotoRun's images are dark (but have more highlight detail). Unfortunately, shadows are mottled and streaky.

If the PhotoRun were only a smidge thinner, it might fit in your wallet.

Price $249
Company Umax
Phone 800.562.0311
URL www.umax.com

boot verdict 8

Compaq Armada 7700

The good, the bad, and the ivory

The Armada 7700 comes armed, but it doesn't come fully loaded.

Of course, what with its Tillamook 233MHz processor, 32MB of EDO DRAM, 20x CD-ROM drive, and 56.6Kbps integrated modem, you might think otherwise. Factor in the built-in AC adapter, wavetable sound, and programmable hot-keys, and you have the makings of one kick-ass machine. But the Armada is robbed of this enviable distinction by its inconsistent performance.

Thanks mainly to the Pentium 233MHz nestled inside, CPU performance, as expected, was damn good. But couple the processor with a slow-as-molasses hard drive and the scale tips alarmingly in the opposite direction. Heck, the 3.0GB hard drive's abysmal transfer rate of less than 2MB/sec was the slowest we've seen in the past year. But since the entire Armada line features removable SMART-compatible hard drives, you can easily upgrade to a faster one (and one toting a larger capacity too). And although you can max out the RAM at 144MB, 16MB of it is onboard, meaning you'll have to waste a good 16MB (occupying one of the two slots) to get beyond the 96MB barrier.

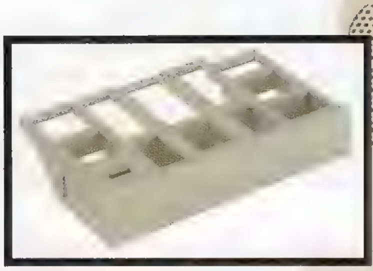
In the video subsystem, regular players NeoMagic, Chips and Technologies, and Cirrus Logic have been benched in favor of S3's first mobile solution, the Aurora64V+. But unlike S3's even newer ViRGEMXi chipset, the Aurora64V+ isn't a true D3D accelerator, thus you'll have to rely on DirectDraw only. Another anomaly—there's no DOS VESA support. We had to install SciTech's *Display Doctor* to bump up to a higher resolution in *Quake*. And even then, the Armada proffered a paltry 11.7fps. Ick. On the flip side, ActiveMovie playback was terrific, with only negligible jitter. (At least it was with the display set at 800x600/16-bit. With a 32-bit color depth, the resulting playback looked suspiciously like it was being dithered down to 8-bit. Weird.) If you plan on displaying the desktop across the LCD and external CRT simultaneously, you can assign different refresh rates for both displays. While the Aurora64V+ is spec'd to support TV-out, sadly a port is not included.

Audio offerings include hardware wavetable sound and stereo speakers positioned on both sides of the LCD—a shrewd engineering move for sure. Plus, they sound sweet too. Oversized volume controls are located on the front (just above the keyboard), with audio ports out of the way in the back. The keyboard offers excellent tactile response, and the oversized, raised, and angled mouse buttons make navigation a breeze. Good thing too—there's no Windows key (although there is room for one—hmmm). The information pop-ups, including battery status and power management controls, all work in DOS.

As previously mentioned, the Armada includes two other treats: a built-in 33.6Kbps modem (yes, it's upgradable) and an integrated AC adapter. Because of this, the Armada's weight balloons up to almost 9 pounds if you elect to carry everything Compaq provides, including such little goodies as space savers and component carrying cases. Regardless, kudos to the engineers who managed to pack all these cool components into the case.

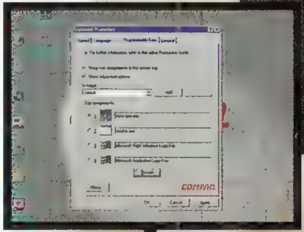
The Armada may have a few performance blemishes, but with a terrific feature set, expanded functionality, and a price of only $3,999, it's definitely worth serious consideration.

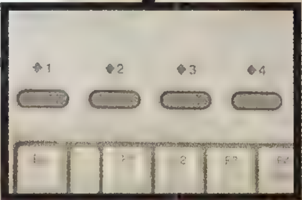
—Bryan Del Rizzo



SPACE SAVER

Don't want to lug eight pounds? Drop the space saver into the drive bay and lose some weight immediately.





PROGRAMMING 101

Programmable hot keys on a notebook? Gotta love it!

under the hood

THE BRAINS

CPU	Intel Tillamook Pentium 233MHz with MMX
L2 Cache	512K write-back
RAM	32MB (144MB maximum)
Video	S3 Aurora64V+ (2MB EDO DRAM)

THE BRAWN

Hard Drive	Various 3.0GB
CD-ROM	Compaq 20x
Expansion Bus	Two Type II, one Type III, CardBus- and Zoomed-Video-compatible
I/O Ports	One PS/2, one serial, one parallel, one monitor, port replicator, built-in AC, microphone, headphone, line-out
Lap Weight	8 pounds, 2 ounces
Carrying Weight	8 pounds, 7 ounces

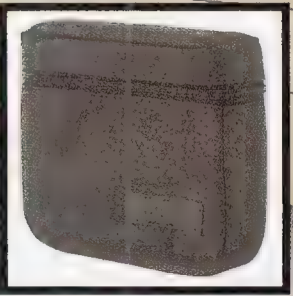
THE BEAUTY

Display	12.1-inch active-matrix display
Sound	ESS 1878 FM/wavetable
Video	800x600, 32-bit
Speakers	Stereo speakers, 1 watt per channel
Communication	Built-in Compaq 7000 33.6Kbps Global SpeedPaq Telephony Modem (upgradable to K56 Flex)

REAL-WORLD BATTERY LIFE 02:02:00

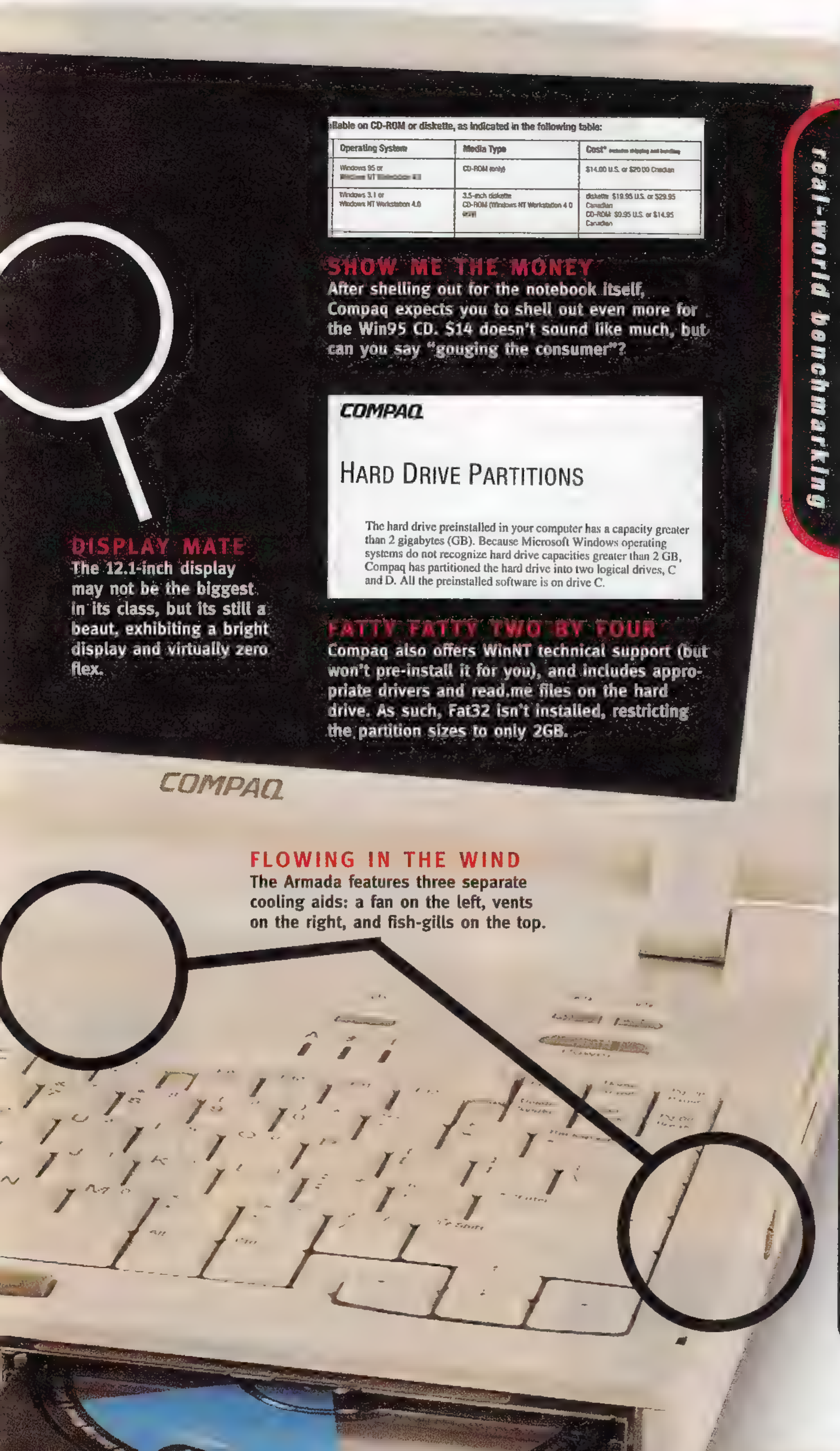
THE BUNDLE Compaq Intelligent Manageability | Online Services | Symantec JustConnect | Microsoft NetMeeting | Microsoft PC Card Manager | PointCast

boot 1:00 down :05



CARRYING CASE CRAZY

The Armada includes a luggage bag for the notebook, a soft carrying case for the drives, and a hard storage case. Phew!



...ilable on CD-ROM or diskette, as indicated in the following table:

Operating System	Media Type	Cost* excludes shipping and handling
Windows 95 or Windows NT Workstation 4.0	CD-ROM (only)	$14.00 U.S. or $20.00 Canadian
Windows 3.1 or Windows NT Workstation 4.0	3.5-inch diskette CD-ROM (Windows NT Workstation 4.0 only)	diskette: $19.95 U.S. or $29.95 Canadian CD-ROM: $9.95 U.S. or $14.95 Canadian

COMPAQ

HARD DRIVE PARTITIONS

The hard drive preinstalled in your computer has a capacity greater than 2 gigabytes (GB). Because Microsoft Windows operating systems do not recognize hard drive capacities greater than 2 GB, Compaq has partitioned the hard drive into two logical drives, C and D. All the preinstalled software is on drive C.

SHOW ME THE MONEY
After shelling out for the notebook itself, Compaq expects you to shell out even more for the Win95 CD. $14 doesn't sound like much, but can you say "gouging the consumer"?

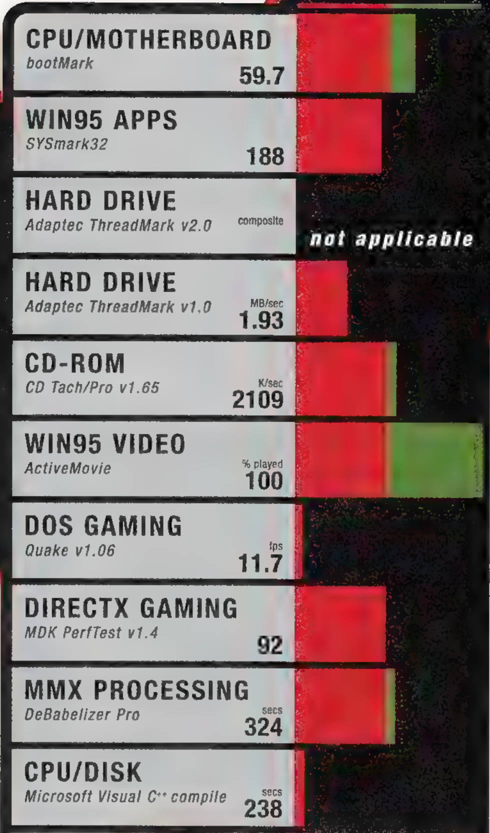
DISPLAY MATE
The 12.1-inch display may not be the biggest in its class, but its still a beaut, exhibiting a bright display and virtually zero flex.

FATTY FATTY TWO BY FOUR
Compaq also offers WinNT technical support (but won't pre-install it for you), and includes appropriate drivers and read.me files on the hard drive. As such, Fat32 isn't installed, restricting the partition sizes to only 2GB.

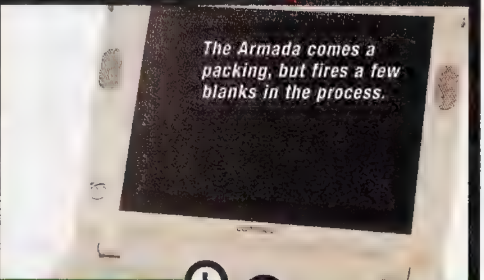
FLOWING IN THE WIND
The Armada features three separate cooling aids: a fan on the left, vents on the right, and fish-gills on the top.

Compaq
Armada 7700

real-world benchmarking



Test	Benchmark	Unit	Result
CPU/MOTHERBOARD	bootMark		59.7
WIN95 APPS	SYSmark32		188
HARD DRIVE	Adaptec ThreadMark v2.0	composite	not applicable
HARD DRIVE	Adaptec ThreadMark v1.0	MB/sec	1.93
CD-ROM	CD Tach/Pro v1.65	K/sec	2109
WIN95 VIDEO	ActiveMovie	% played	100
DOS GAMING	Quake v1.06	fps	11.7
DIRECTX GAMING	MDK PerfTest v1.4		92
MMX PROCESSING	DeBabelizer Pro	secs	324
CPU/DISK	Microsoft Visual C++ compile	secs	238



The Armada comes a packing, but fires a few blanks in the process.

+	−
Fast processor	Sillooowwww hard drive
Video and audio subsystems	Win95 CD costs extra!
Programmable hot-buttons	Just average performance
Integrated AC	No TV-out port
Integrated modem	No USB port
Pop-up information	

Price $3,999
Company Compaq
Phone 800.345.1518
URL www.compaq.com

boot verdict 8

A complete breakdown of benchmark results is available on the *bootNet*. Point your browser to www.bootnet.com

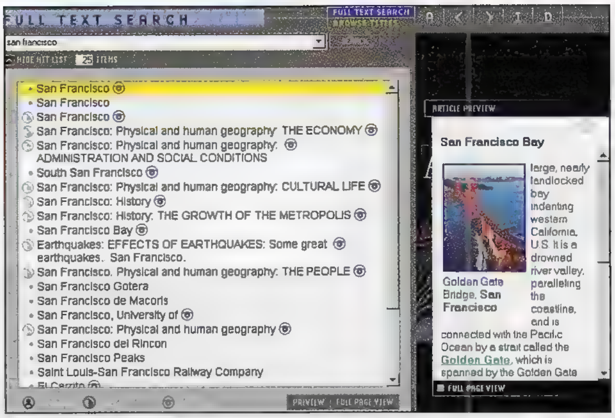
MOUSE IN THE HOUSE
Check out those oversized mouse buttons.

Reference Desk

Facts and figures at your fingertips

Reference publishers began putting their print volumes—including encyclopedias, dictionaries, and thesauri—on CD-ROM a few years ago, making research simpler and oh-so-much faster. Now publishers are combining the best of print with the best of the web so information is as up-to-date as possible. We look here at updates of previous releases to check out what's new.

—André Vrignaud



san francisco

- San Francisco
- San Francisco
- San Francisco
- San Francisco: Physical and human geography: THE ECONOMY
- San Francisco: Physical and human geography: ADMINISTRATION AND SOCIAL CONDITIONS
- South San Francisco
- San Francisco: Physical and human geography: CULTURAL LIFE
- San Francisco: History
- San Francisco: History: THE GROWTH OF THE METROPOLIS
- San Francisco Bay
- Earthquakes: EFFECTS OF EARTHQUAKES: Some great earthquakes.. San Francisco.
- San Francisco. Physical and human geography: THE PEOPLE
- San Francisco Gotera
- San Francisco de Macorís
- San Francisco, University of
- San Francisco: Physical and human geography
- San Francisco del Rincon
- San Francisco Peaks
- Saint Louis-San Francisco Railway Company
- El Cerrito

San Francisco Bay

Golden Gate Bridge, San Francisco

large, nearly landlocked bay indenting western California, U.S. It is a drowned river valley, paralleling the coastline, and is connected with the Pacific Ocean by a strait called the Golden Gate, which is spanned by the Golden Gate

Britannica CD 98 ***returns a wealth of info for most any search.***

Encyclopedia **Britannica** 98

Encyclopedia Britannica's CD 98 reference has the answer to any question—and an in-depth one at that. Going through 72,000 articles (over 44 million words) by hand could take a while; luckily, this modern adaptation of the 32-volume print edition of the *Encyclopedia Britannica* gives you the tools to find what you want.

You can search the contents of the disc via natural language (e.g., "Who invented the television?") or craft a more detailed search with Boolean search terms. However, the natural-language search engine proved powerful and generally returned relevant entries on the first attempt.

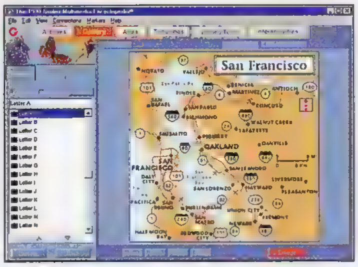
An additional online component connects you to the full-text version of the encyclopedia on the web, allowing you to search new entries that haven't made it to the print or CD editions yet, along with an index of web links. In addition, *Encyclopedia Britannica* has finally left behind its old web-based look and replaced it with a far slicker interface. Although the new interface still uses web technology, it's completely transparent to the average user. Also new in this edition is the ability to create custom reports, tables, and graphs comparing social, political, and economic data of 191 countries.

You just can't get a more authoritative and useful encyclopedia anywhere else.

boot verdict 9

Price ***$150***
Company ***Encyclopedia Britannica***
Phone ***800.747.8503***
URL ***www.eb.com***

Grolier's Multimedia Encyclopedia 1998



Detailed maps of the world abound in* Grolier's *encyclopedic offering for 1998.

Grolier's Multimedia Encyclopedia 1998 is a fine reference work with a few touches that lift it above the competition. The two-CD set is in many ways a standard encyclopedia. You can search terms, follow links of interest, and peruse the standard collection of images, maps, and videos. Images are particularly clean and readily available. The maps are highly effective, allowing you to drill down through multiple layers for more detail—in some cases, all the way down to street level.

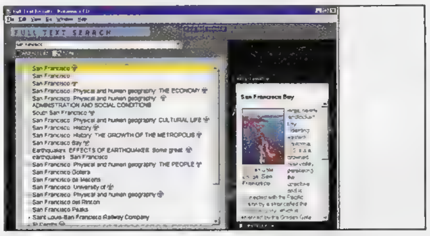
What lifts Grolier above other references is an excellent online element called The Online Knowledge Explorer. This feature lets you search additional reference works, including *The New Book of Knowledge*, the *Encyclopedia Americana*, and the *Grolier Internet Index*, a collection of 21,000 web links that guide you to additional information. On top of that, you have the assurance of knowing your reference work will never be out of date—Grolier updates approximately 500 articles a month, all available on the net.

We highly recommend *Grolier's Multimedia Encyclopedia 1998*. Beyond the common features of CD-ROM reference works, the online element pushes it over the top. You might get more detailed articles with *Encyclopedia Britannica's 1998* offering… but not by much.

boot verdict 8

Price ***$45***
Company ***Grolier Interactive***
Phone ***203.797.3530***
URL ***gi.grolier.com***

Collier's Encyclopedia 1998



Is* Collier *a poor man's multimedia encyclopedia or a rich man's enhanced web site? You decide.

Collier's Encyclopedia 1998 is an application with an identity crisis. At first glance, things look good. But for some reason, the designers used web-based technologies. The package comes on CD specifically so users can access vast amounts of data on their desktop. However, the entire work is based within a web browser and uses browser-based technologies to display all media.

You first recognize this browser-specific slant during install—you're forced to install Netscape *Communicator* (even if you already have a copy). Then you get hammered with the web slant every time you use the application—you literally browse local web pages. Why go the web route? I'd guess Sierra is planning to release a web-based subscription encyclopedia on the net. Unfortunately, that leaves you with a poor stand-alone product.

Beyond the web-based annoyances, the product itself is average. You can search for topics, follow hotlinks, zoom in on maps, and so forth. In short, although it's not a bad product by any means, the lack of special content and a less-than-stellar interface keeps Collier's from being our pick.

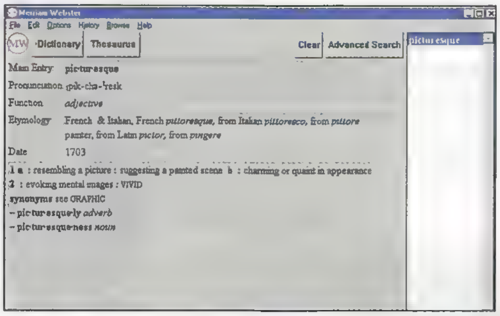
boot verdict 6

Price ***$75***
Developer ***Collier Newfield***
Publisher ***Sierra On-Line***
Phone ***800.757.7707***
URL ***www.sierra.com***

Merriam-Webster's Collegiate Dictionary

Merriam-Webster's Collegiate Dictionary and Thesaurus has 160,000 entries, 214,000 definitions, and 35,000 etymologies; the thesaurus has 130,000 synonyms, antonyms, and idioms, with about 5,000 of those entries used in context.

This package is available in a "Deluxe Audio Edition," so you can hear words pronounced—useful when you just can't remember how to pronounce "picturesque." (It's *not* "picture-squee".) Perhaps more interesting is the ability to look up words in new ways. You can search for terms by language of origin, date of first use, and part of speech. Even more useful is that you can search through the actual text of the definitions, for when you can't remember what word you're looking for but you know the meaning.


Merriam Webster
File Edit Options History Browse Help
MW
Dictionary
Thesaurus
Clear
Advanced Search
picturesque

Main Entry picturesque
Pronunciation ˌpik-chə-ˈresk
Function *adjective*
Etymology French & Italian, French *pittoresque*, from Italian *pittoresco*, from *pittore* painter, from Latin *pictor*, from *pingere*
Date 1703

1 a : resembling a picture : suggesting a painted scene **b** : charming or quaint in appearance
2 : evoking mental images : VIVID
synonyms see GRAPHIC
– **picturesquely** *adverb*
– **picturesqueness** *noun*

Merriam-Webster's *Windows 3.1-like interface does little for your dictionary-perusing pleasure.*

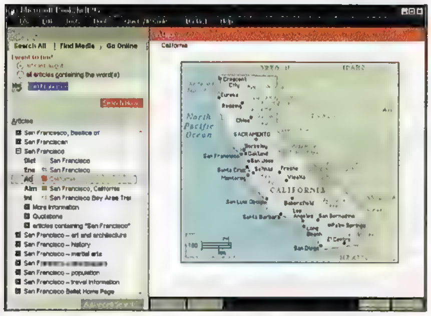
All-in-all, Merriam-Webster's new foray into the CD-ROM reference market is a reasonable, if not brilliant, effort. Make no mistake—if you want to look up a word, it does the job, especially if you want to *hear* it, too. However, if you're looking for a more robust tool that's integrated into your operating environment and applications, spend $25 more for *Microsoft Bookshelf 98.*

Price $25
Company Merriam-Webster
Phone 800.828.1880
URL www.m-w.com

boot verdict 6

Bookshelf 98

Microsoft Bookshelf 98 is one of the handiest, though not the deepest, reference compilations currently available on CD-ROM. On a single disc, you get access to print works such as a dictionary, thesaurus, quotation reference, encyclopedia, atlas, and almanac. You also get a ZIP code finder, a chronology, a computer/Internet dictionary, and an Internet web directory. And because it's a Microsoft product, you get seamless integration and access to *Bookshelf*'s contents from Windows and most *Microsoft Office* applications.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San Franciscan
San Francisco
San Francisco, California
San Francisco Bay Area Tra
More Information
Quotations
articles containing "San Francisco"
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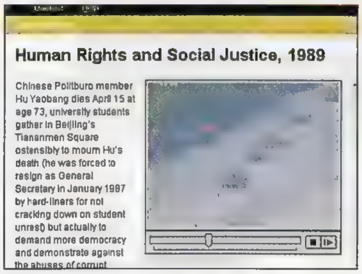
San Bernardino
Palm Springs
Long Beach
El Centro
San Diego

Bookshelf 98 *lets you search through all reference works simultaneously.*



Human Rights and Social Justice, 1989

Chinese Politburo member Hu Yaobang dies April 15 at age 73, university students gather in Beijing's Tiananmen Square ostensibly to mourn Hu's death (he was forced to resign as General Secretary in January 1987 by hard-liners for not cracking down on student unrest) but actually to demand more democracy and demonstrate against the abuses of corrupt

Multimedia video clips are well integrated into **Bookshelf**'s *interface and are rarely gratuitous.*

Unfortunately, trade-offs had to be made to fit all this content on one disc. Most larger reference works have been trimmed. For example, a search on "San Francisco" turned up a 420-word *Encarta* article with seven hotlinks; the same search on the *Britannica* CD found a 4,840-word article with 34 hotlinks.

Still, *Microsoft Bookshelf* deserves to be in your CD-ROM drive whenever you're at work. Few reference works combine quick and easy access to information while being as simple to use.

Price $50
Company Microsoft
Phone 800.426.9400
URL www.microsoft.com

boot verdict 8

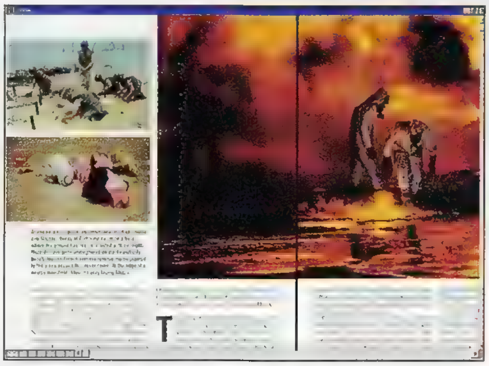
The Complete National Geographic

Your parents no longer need to store the miles and miles of back issues of *National Geographic*—and now you can search for those favorite articles with ease!

The Complete National Geographic is almost perfectly named. Its 30 CD-ROMs archive 1,200 issues of *National Geographic* spanning 11 decades, starting from 1888. We're talking about more than 9,000 articles, or over 188,500 printed pages, including all the ads. Every page of every issue was scanned and indexed, allowing you to search the archive in a variety of ways, including by topic, subject, date, issue, photographer, advertiser, and even map titles.

Once you've found an issue or article of interest, you read it onscreen by viewing the entire scanned page. The pages are displayed in 8-, 16-, or 24-bit color, with a custom palette built on the 256 colors that best represent the images. You can also print articles to either black and white or color printers.

The only weak points are rather nitpicky. For one, when you first run the program, you are forced to watch four Quicktime video clips in succession—almost a minute worth—including a Kodak ad and a montage of *National Geographic* logos. You can't abort them. Thankfully, you can skip them the next time by clicking—over and over—to kill each video as it comes up. The only other disappointment was that Mindscape didn't include the fold-out maps/posters that often came with the issues. A pity, since some of them were quite stunning.



Different viewing controls allow you to zoom in on and rotate images as you wish in **National Geographic.**

The (almost) *Complete National Geographic* is highly recommended to any fan of the print publication—and not only because you can finally get all that shelf space back!

Price $180
Developer National Geographic
Publisher Mindscape Inc.
Phone 800.897.9900
URL www.mindscape.com

boot verdict 8

Sex Sells

But who's buying?

With the advent of multi-meg silver discs, smut purveyors have taken both CD-ROM and DVD-ROM formats to their sweatier extremes. But despite promises of greater storage capacity, better picture quality, and "total interactivity," the question remains, does sex have a place on the PC?

If a 500 polygon big-breasted adventurer gets you hot and bothered, maybe it's time to step up to the real thang.

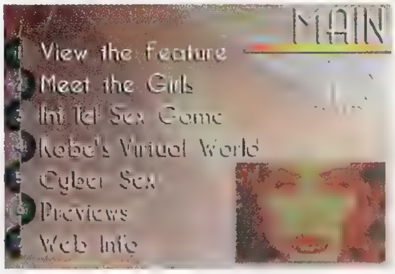
—Andrew Sanchez

Bad Wives *packs multiple camera angles and more for you DVD freaks out there—but don't even compare its interactivity with anything remotely real-time.*

Bad **Wives**

Hailed as last year's "Best Adult Film," Vivid Interactive's *Bad Wives* jumps to DVD, promising to take full advantage of the DVD format. If only Vivid had remembered to pack picture quality and interactivity along for the ride.

Bad Wives' multiple camera angles allow you to watch the feature film from an alternate angle with which to the see the rampant flesh friction when a little DVD logo appears from time to time in the lower right hand corner. Despite being shot on film, *Bad Wives'* visual quality suffers when crunched down into MPEG-2 format-artifacts galore dance inside solid colors and pixelation runs rampant. DVD is capable of up to 720 pixels per horizontal line vs. VHS tape's 320 pixels for crystal-clear pics, but *Bad Wives'* underachieving graphics seem more at home on an MPEG-1-compressed CD-ROM, as opposed to the GB-holdin' DVD. A less-aggressive compression ratio would have nipped these problems.



From here, you can click your way toward ecstacy.

And the "interactive" aspect of *Bad Wives* is pretty limp, especially compared to the real-time action found in Pixis's *Diva X* series. One segment of *Bad Wives* promises hot one-on-one action with Kobe Tai, a perky Asian adult actress. But guess what, Skippy? Vivid's idea of interaction is playing "find the hotspot" on a pre-rendered background. Your reward? A two-minute loop of Kobe grunting and moaning—what bunk! The other option, "Int. Tel. Sex." is another lackluster "find the hotspot and watch the clip." Yawn-it's like *Myst*... but with sex! Pixis's revolutionary and highly interactive Touch-and-Feel User Interface needn't worry about this competition. At least the disc doesn't come with any regional black-outs—after all, porn is internationally spoken.

Ultimately, *Bad Wives* makes a better VHS rental than a DVD purchase.

Price $40
Company Vivid Interactive
Phone 800.822.8339
URL www.vividdvd.com

boot verdict 4

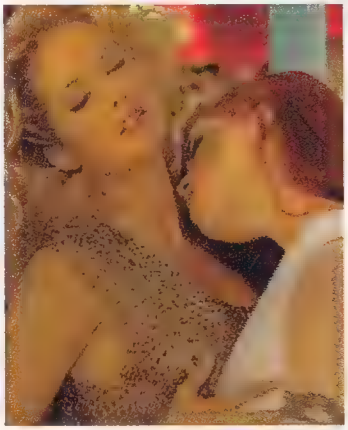
Riana Rouge

Former *Playboy* Playmate Gillian Bonner runs around half-nekkid and gets medieval on almost everyone she meets as a secretary-turned-superheroine in the much-ballyhooed "sensual adventure" game *Riana Rouge*.

Let's get thing one straight here—*Riana Rouge* is a screen-troller where you'll spend most of your time looking for unmarked hotspots—once you find one, clicking engages some hokey, pixelated FMV.

Egads! She's been gibbed!

Riana Rouge spans three CDs, with Bonner and crew prancing around in dominatrix gear and revealing negligees and superimposed on uninspired pre-rendered 3D backdrops that reek of early 80s first-generation point-and-click adventures, such as the *Journeyman Project*. While there's a variety of locales to investigate, they get stale real quick.



She's mad, she's bad, and she's horny! She's Riana Rouge, and you'd best bring protection.

CHECKLIST
Riana Rouge
Version: 1.0
Max Res/Color 640x480/256-bit
Win95

Interacting with NPCs comes down to clicking on one of the colored gems in the lower right-hand corner, with each gem signifying a particular emotional state. Choices can branch off to a sudden and unexplained bloody death, or continue adventuring. While this interface is intriguing (and may pave the way for more realistic NPC interaction in future games), the *Riana Rouge* reality is painfully simplistic.

Let's not forget the scads of soft-core bumping-and-grinding that goes on between Rouge and her cohorts, and the disturbingly graphic death scenes that look more at home in *Resident Evil* than a "sensual thriller."

No amount of T&A can overcome the dusty graphics, hokey blue-screened FMV, and stank-ass gameplay. *Riana Rouge* is destined to join *Voyeur* as a bargain-bin titillating adventure best not taken.

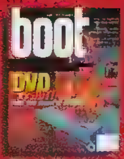
Price $50
Developer Black Dragon Productions
Publisher Eidos
Phone 800.616.2022
URL www.blackdragon.com

boot verdict 2

backissues

Vol. 1, No. 1
Aug/Sept 96
Dream Machine

Vol. 1, No. 2
Oct 96
Make Multimedia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DVD Preview

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Dec 96
'96 Lust List

Vol. 2, No. 1
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Vol. 2, No. 2
Feb 97
MMX

Vol. 2, No. 3
Mar 97
The In Crowd

Vol. 2, No. 4
Apr 97
ABC's of PDAs

Vol. 2, No. 5
May 97
State of the Art Sound

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Jun 97
Pentium II

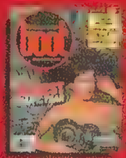
Vol. 2, No. 7
Jul 97
Third Generation 3D Cards

Vol. 2, No. 8
Aug 97
Pentium Killers

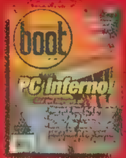
Vol. 2, No. 9
Sep 97
Dream Machine '97

Vol. 2, No. 10
Oct 97
Direct X Files

Vol. 2, No. 11
Nov 97
Accelerated Graphics Port


Vol. 2, No. 12
Dec 97
1997 Editors' Lust List

Vol. 3, No. 1
Jan 98
1998 Pure Power Preview


Vol. 3, No. 2
Feb 98
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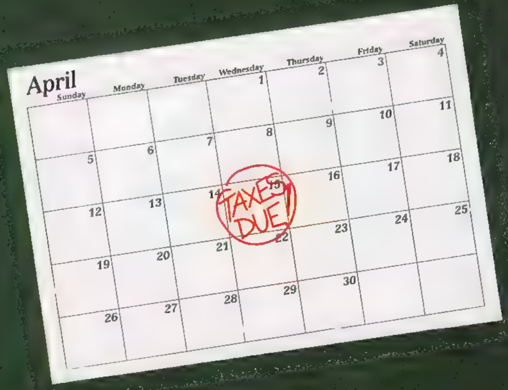
Stop Playing Games!

(It's time to do your taxes.)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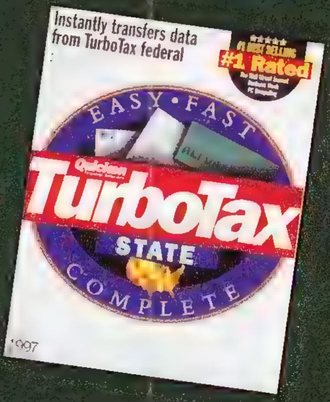
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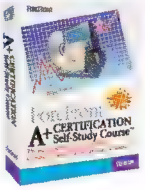

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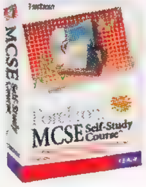

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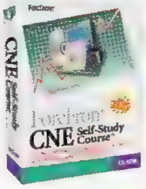

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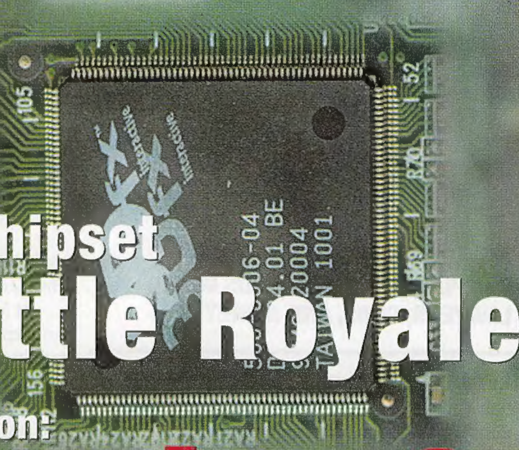

3D Chipset Battle Royale

Attention: Voodoo 2 has entered the bootLab.

We repeat: Voodoo 2 has entered the bootLab. But is it "really" the fastest 3D chipset in the house? Our ultimate 3D showdown gathers the hottest 3D video cards and pits them against each other in a brutal bare-knuckles brawl.

ISSUE NUMBER 21
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Microsoft Under Bloody Seige

ATF AGENTS STORM REDMOND COMPOUND; MS RESPONDS WITH LAWYERS, GUNS, AND MONEY

The Commander's broadcast visage.

REDMOND, WA—Government agents stormed the Microsoft campus early yesterday morning, igniting a spectacular firefight that claimed 113 lives and is threatening political stability in the northwest United States. The siege followed a ten-day standoff during which Microsoft employees bunkered down with automatic weapons in defiance of a court-ordered antitrust decision.

On March 14, the Supreme Court ordered Microsoft to divide itself in half, and then divide each of those halves in half, and each of those halves in half, and so on and so on, until each independent subsidiary consisted of a project manager, a marketing flack, and a coffee machine.

Microsoft CEO Bill Gates responded by telling the Court "I want you to go to hell today," and then proceeded to stock armaments.

Yesterday's shootout began at 6:21 a.m. and abruptly ended at 5:30 p.m. when MSNBC switched coverage to Al Roker's review of *Blues Brothers 2000*.

At 5:29 p.m., Gates flew over the carnage in an experimental helicopter made of impenetrable alloys and announced the following from a bullhorn:

"Attention anti-capitalist, communist pigs. Do not attempt to shoot me from the sky. I am flying over the carnage in an experimental helicopter made of impenetrable alloys. Lay down your weapons before it's too late. I repeat: Lay down your weapons. And buy Microsoft. We're at $155 a share and climbing!"

As nightfall hit, Gates changed out of his battle fatigues, ingested a handful of southeast Asian hallucinogens, and entered a state of elevated religious awareness. Wearing nothing but a sari and surrounded by captured ATF agents imprisoned in makeshift bamboo cages, the commander-god held court, slowly ruminating on topics of the day.

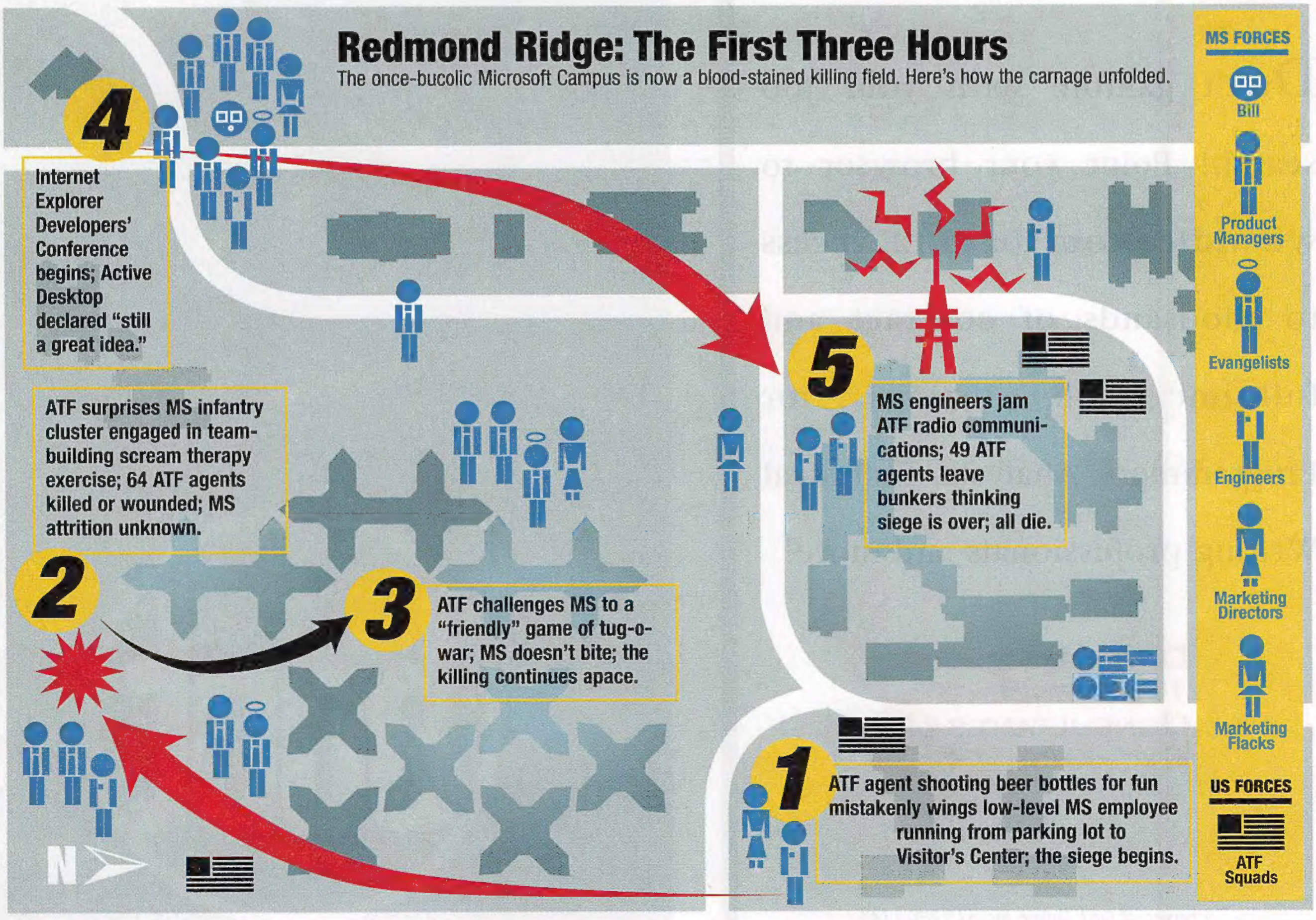
"The destruction of Netscape was a funny 'concept.' People 'got' it," Gates said, gesturing with his fingers as if to punctuate his words with quotation marks. "The American people saw the intrinsic humor in the carpet bombing of an ill-conceived and failing technology company.

"And the French—they too shall fall."

Government sources believe Microsoft has enough employees, supplies, and ammunition to delay release of its assets until Q3. The government also believes Microsoft has won the support of rural Washington state militiamen, who are willing to pounce like frisky kittens on any anti-government insurrection that so much as ruffles a few pieces of underbrush.

President Clinton has issued a statement saying the U.S. would be willing to give up Washington state and parts of Oregon if Microsoft would remove an unwanted manila folder that is sitting on his Oval Office desktop.

Fighting is expected to resume today, followed by MSNBC coverage of Al Roker making an impassioned plea for a sequel to *Cool Runnings*.



Redmond Ridge: The First Three Hours

The once-bucolic Microsoft Campus is now a blood-stained killing field. Here's how the carnage unfolded.

4 Internet Explorer Developers' Conference begins; Active Desktop declared "still a great idea."

2 ATF surprises MS infantry cluster engaged in team-building scream therapy exercise; 64 ATF agents killed or wounded; MS attrition unknown.

3 ATF challenges MS to a "friendly" game of tug-o-war; MS doesn't bite; the killing continues apace.

5 MS engineers jam ATF radio communications; 49 ATF agents leave bunkers thinking siege is over; all die.

1 ATF agent shooting beer bottles for fun mistakenly wings low-level MS employee running from parking lot to Visitor's Center; the siege begins.

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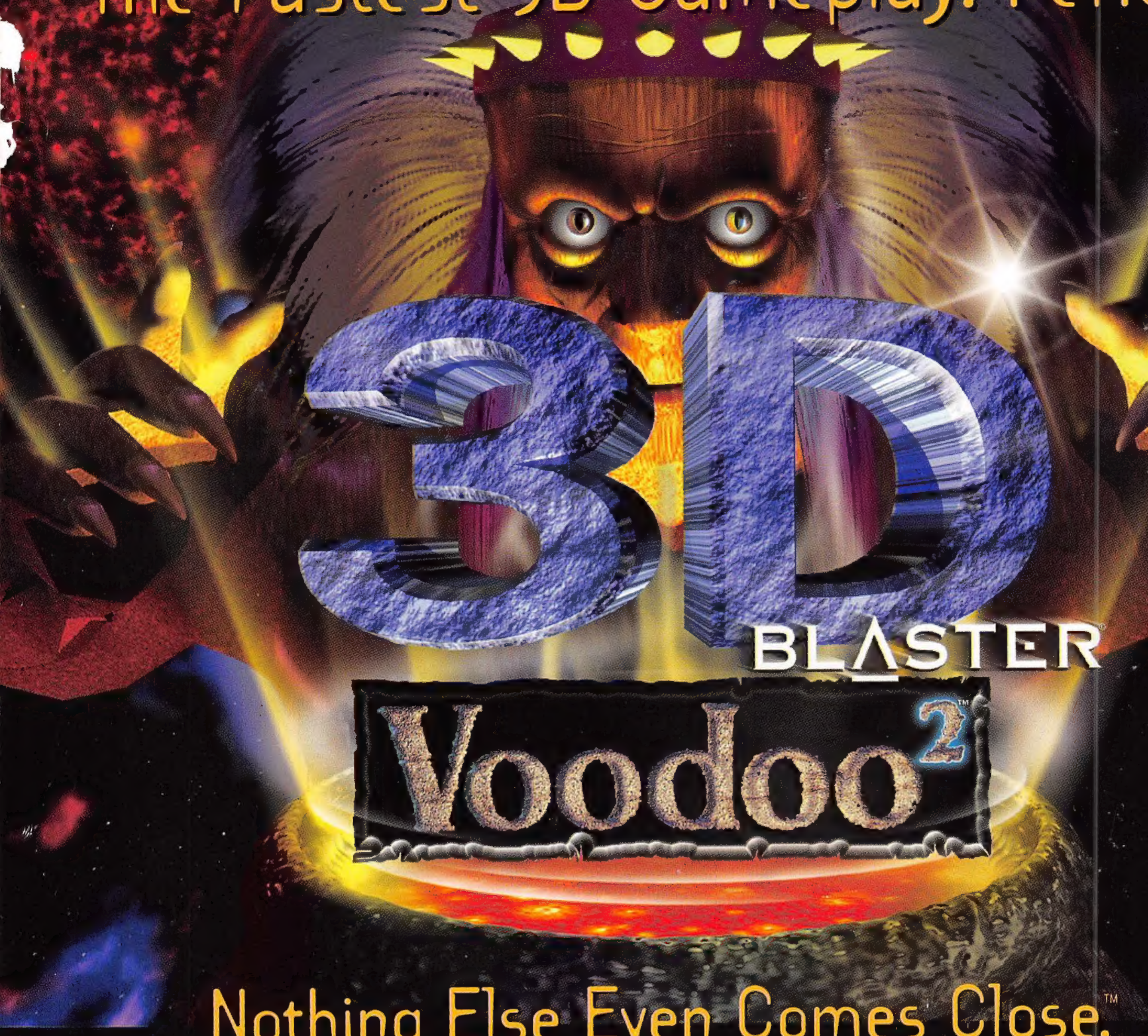

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